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THE TREATMENT OF MALIGNANCY BY COMBINED METHODS*

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A CURSORY survey of results obtained in the treatment of malignancy by using radium alone, or roentgen rays alone, or surgery alone, while disclosing the good features of each, points to the shortcomings of each method used separately, and leads to the conclusion that the successful physician of to-day can no more pin his faith to any single one of these agencies than can the generals of contending armies pin their hopes of victory upon the use of aircraft, artillery, or dreadnaughts alone; but just as the latter depend upon the proper coordination and cooperation of all agencies for the greater deterrent effect upon the enemy, so must the efficient practitioner combine every means for triumphal attacks on malignancy.

Radium is the most powerful form of radiation we possess when applied locally to the malignant growth. The value and limitations of radium when used alone or when applied with other agents must define its present place in medicine. In radium institutes it is being employed largely in the hopeless cases; and in many cases it is employed alone when better results would be obtained if combined with roentgen rays for extensive metastases, and with electric coagulation or surgery to remove necrotic or degenerated tissue. In private practice there are a few men who are using radium intelligently and conservatively; but a number are ultra-enthusiastic and apply it in every case of malignancy, regardless of the extent or nature of the disease.

Roentgen rays have been adapted in so many varied forms of practical uses, particularly in making diagnoses, that it is not surprising to find them used in other applications by persons entirely ignorant of their physiological action and unfamiliar with the clinical history of malignancy. Beneficial results obtained in this manner by a physicist or technician can be scarcely other than accidental.

Removal by the knife twenty-five years ago was considered the only legitimate method of treatment, regardless of the type, location or stage of the disease. If the patient was inoperable nothing was done, or else an operation was performed for palliation. But it is gratifying to note

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that all the better surgeons to-day realize that operation is seldom if ever indicated for palliation, that even in the early cases, cutting out the center of a malignant growth never retards but hastens its progress. A few careful observers even advise anti-operative radiotherapy, and nearly all are beginning to advise postoperative treatment.

There is no question that many cases have been and can be cured by the different methods singly; but usually the physician or surgeon in the past advised the method with which he was most familiar, instead of selecting the one or the combination that would yield the best end results.

Mastery of all forms of radiation is the first essential in efficient treatment of the various forms of malignancy. Each form of radiation has its place and has a decided advantage in its place. Radiation should not be used when operation is indicated, any more than a surgeon should cut out the center of a cancerous growth and expect radiation to do the rest. Such a practice brings both the surgeon and the radiotherapeutist into disrepute, because the profession is rapidly learning that each has his place.

Electric coagulation is a valuable method of removing tissue of low vitality which still contains more or less malignant tissue when the adjacent glands have been walled off by radiation. It also has the advantage over removal by the knife, in that the diseased tissue can be eradicated without opening the blood and lymph vessels. The chief advantage of destroying tissue by electric coagulation instead of by actual cautery or chemical agents is that there is so little inflammatory reaction produced, because the effect is not produced by the intensity of heat or chemical agent, but the tissue is destroyed by the resistance of high frequency current passing through.

Many contend that radiation from the roentgen tube and radium are the same thing; but we know this is only partly true. There is a difference in the physical properties between the two forms of radiation, as well as a somewhat different physiological action on both diseased and healthy tissue. In many instances, those using only the roentgen rays will say that all can be accomplished with this form of radiation that can be accomplished by both radium and the roentgen rays, while those who employ only radium may make a similar statement for this agency, or may even say that radium alone is superior in all cases where radiotherapy is indicated. Such statements show that the radiotherapeutist is not familiar with both forms of radiation and has not treated a large number of cases by both methods.

It is generally conceded that it is the rays which are absorbed in the tissues and the secondary radiation set up therein that produce the changes in the tissues. The difference in the physiological action between radium and the roentgen rays may be due to radium giving off beta rays, and because the gamma rays from radioactive substances set up more intense secondary or beta rays than from the roentgen tube. Without going further into the physical properties of each, it should be remembered that radium and the roentgen rays are closely related in their action on tissue, and should be discussed or considered together. Both forms of radiation have the so-called selective and inflammatory action on living tissue. Each will produce a destructive inflammation if given with sufficient intensity, but with radium a reaction of much greater degree can be produced without permanently injuring healthy tissue than with the roentgen rays. This is an important therapeutic difference between the two agents, and is very important in treating certain malignant conditions. Therefore radium can be used therapeutically with a greater destructive power locally than the roentgen rays, but great care must be exercised, particularly so if cosmetic results are desired.

In order to produce tissue changes, either by radium or the roentgen rays, it is necessary that sufficient quantities reach

the tissues to be treated, and do not destroy adjacent healthy tissue, or tissue through which the radiation must pass. When a tube of radium is brought in contact with the growth, a certain dosage will inhibit proliferation, and will finally cause necrosis of the cells nearest it, while farther away from the tube the same kind of cells may be only stimulated. Therefore there is a limit through which the rays can pass through healthy tissue, without producing destruction, and destroy malignant cells. It has been demonstrated that when radium is placed in contact with a cancerous mass, the malignant cells can only be destroyed from 2½ to 4 centimeters, or a little over 1 inch from the radium tubes. By cross-firing this can be increased somewhat, but will not take the place of the source of energy being placed at eight or ten inches.

Radiation to the depth of ½ to 1½ inches is usually sufficient to destroy most malignant growths, but it will not reach the outlying cells in the lymphatic glands. Deeper effects can be obtained by placing the source of energy at a distance from the mass to be treated, and by cross-firing. By placing the radium or the roentgen tube eight inches from the surface and treating through seven ports of entry, a tumor four inches below the surface will receive about the same amount of radiation the skin of any one area receives. Then, since most malignant cells are about two to five times more susceptible to the destructive action of the rays than normal tissues, it is possible to produce clinical retrogression of malignant growths, and even within the lymphatic glands at some distance from the surface, without destroying the overlying skin.

In some cases, by inserting radium into the growth, larger amounts of tissue can be destroyed; but we are well aware today that when a cancerous mass is opened, and not completely removed, it nearly always hastens metastases, the same as an incomplete operation. Therefore, I never advocate inserting radium into a cancerous growth unless the surrounding lymphatics have been thoroughly treated, and the cancerous mass at least partially walled off.

From a clinical standpoint, all things being equal, radium and the roentgen rays may be divided into two classes, namely, those in which a localized reaction is desired, when radium is preferred, and those in which large areas are to be treated, when the roentgen rays are preferred. In many instances radium should be used locally, while the adjacent lymphatics should be treated by the roentgen rays. The exact comparison of the two forms of radiation is extremely difficult, due to the wide difference in technic, and the wide variation of results reported by the various writers.

No tissue is unaffected either by the rays from radium or the roentgen tube, provided the intensity be sufficiently great, and the exposure sufficiently long. In general, the rays in small doses have a stimulating, and in large doses a destructive action. There is always a latent period after the application of the rays, or occurrence of changes in the tissues. The larger the dose, the shorter the latent period will be. Every kind of tissue acts in its own specific way. The gland cells will be destroyed by a dose which does not harm the cells of the connective tissue or the skin; in other words, the sensitiveness to the action of the rays varies with the type of cell, and this is what is meant by the selective action.

Diseased tissues are more easily influenced by the use of either radium or the roentgen rays than normal healthy tissues. The action of the rays varies considerably with the type of disease under treatment. It requires considerably less radiation to destroy sarcoma in the lymphatics than it does to destroy carcinoma. This could be illustrated by treating lymphosarcoma of the cervical glands, where there is a large mass, and in treating carcinomatous glands which have metastasized from the lip, tongue or throat. The large sarcomatous mass will disappear much more quick-

ly under the same amount of treatment than the small carcinomatous glands. The results obtained in the treatment of sarcoma of the mediastinum are very marked when treated with radium or the roentgen rays externally, in comparison with mediastinal involvement from carcinoma of the breast. If observed by roentgenograms, sarcomatous masses respond rapidly, while carcinomatous masses decrease slightly or the growth is only inhibited. There is often a difference in two patients with the same disease responding to the same amount of radiation. This has led to much confusion; and unless the radiotherapeutist is familiar with these facts he is very likely to make mistakes in drawing his conclusions.

As before stated, in treating four inches below the surface of the skin, it is necessary to give seven erythema doses through different skin areas in order to obtain an erythema dose four inches below the surface. Carcinoma will not be much affected unless this amount of radiation is given, while a sarcomatous mass would probably be reduced in size by from one-third to one-fifth of this amount of radiation. We know that many have reported excellent results by applying radium externally near the skin in sarcoma of the mediastinum, while the same results have not been reported in carcinoma, as too small amounts of the radiation would reach the mediastinum even with cross-firing, without permanent injury to the skin, unless the energy was placed at a distance in order to give almost a homogeneous ray three or four inches below the skin.

It is a rule, in the treatment of both carcinoma and sarcoma, to give as heavy a dose as the normal tissue will stand, and to treat the glandular tissue as far away from the growth as possible. It is also a well-known fact that epitheliomas of the rodent type respond to less radiation than those of the squamous variety. The fact that it requires so much more radiation to cure squamous epithelioma, and that the adjacent glands are so nearly invaded, is no justification for statements that this type cannot be cured by radiation. It is also true that an epithelioma situated on the mucous membrane is always more malignant in character than where it starts on the skin. Besides proficiency in the physiological actions of both radium and the roentgen rays, a careful study must be made of the pathology of the different types of tumors and the manner in which each spreads. Metastases from the earliest stages to the time the case is inoperable, and the manner in which the patient finally succumbs to the disease, must be carefully observed before a radiotherapeutist is qualified. For the purpose of description, malignancy is divided into superficial lesions, which do or do not metastasize; those in which the disease starts in a superficial organ like the breast and which have early and fatal metastases, and those in which the growth starts in the uterus and adjacent glands and metastasize both early and late.

Two types of epithelioma only will be considered, viz.: basal or rodent ulcer, which does not invade glands, but if left untreated eventually destroys everything in its way; and the squamous variety, which nearly always metastasize early and, unless entirely eradicated, always prove fatal.

Radium and the roentgen rays should always be considered first in treatment of epithelioma, because, when properly applied, practically all epitheliomatous tissue will disappear and there are fewer recurrences than by any other method. It is a perfectly legitimate method of treatment in proper hands, but it is a method liable to abuse if it is not restricted to its proper field.

Results obtained in the treatment of epithelioma of the lower lip by radium, supplemented by the roentgen rays, have proven equal or superior to those obtained by surgery. This is true in early as well as in advanced cases. Epithelioma of the lower lip is a serious condition, and radiation, when employed, must be given in such a manner as to destroy all cancer cells in

the local lesion and in the adjacent lymphatic glands. When so given, over 90 per cent of the early superficial cases are permanently cured without deformity, more advanced cases are cured, and hopeless cases receive retardation and palliation which cannot be accomplished by any other method.

It has been demonstrated that radium will destroy cancer with a definite degree of certainty when the tubes are in contact with the surface for a depth of from 2½ to 3 centimeters, and by increasing the distance of the radium the depth at which cancer can be destroyed is increased. The lip is never any thicker than this, and the efficiency can be increased by cross-firing, or by placing a tube on the outside, one on the inside, and one on the top of the lip, so that the entire diseased area of the lip receives the best form of radiation.

In treating epithelioma of the lower lip, it must be remembered that cancer cells are from two to five times less resistant than normal tissue, depending upon the type of the lesion. Squamous cell epithelioma requires from two to four times more radiation to eradicate the disease than the basilar form. A few years ago this fact led many to believe that the squamous or the more malignant form could not be cured by radium. The reason was that insufficient dosage was given, and that small fractional doses were ineffective. Neither did they treat the submental, submaxillary or deep cervical glands thoroughly. Experience of the past certainly justifies the conclusion that cutting out the center of a wide-spreading lesion does not diminish the age of the cancer; but, on the other hand, the remaining disease often appears to grow more actively as the result of operation, while destroying the growth locally by radium does not hasten the process in the glands. A cure is never obtained unless the disease in the lymphatics is completely eradicated.

Anyone treating epithelioma of the lower lip should make a careful study of the lymphatic glands and the manner in which they metastasize. The lymphatics draining the lower lip are the submental, which receive the lymphatic vessels from the chin and central portion of the lower lip, and the submaxillary receive the lymphatics of the lateral portion. The submaxillary salivary gland is closely connected and often metastasizes. There is an anastomosis between the lymphatics which drain both sides of the lower lip as well as those draining the central portion. This must be remembered when radiating the lymphatics of the neck. The deep cervical chain extends from the mastoid process to the clavicle: some of the glands lie behind the internal jugular and subclavian veins and cannot be reached surgically without the removal of the jugular. The cervical glands metastasize from the submental and submaxillary. When the submental and submaxillary are palpable, some cancer cells usually have reached the deep cervical chain. If a radiotherapeutist is going to treat epithelioma, he must realize the early invasion of the lymphatic chain the same as the surgeon and treat them by radiation as carefully as a radical operation is performed. The writer has seen cases of epithelioma of the lower lip in which only the lesion of the lip received treatment and in which at the same time the lymphatic glands were involved.

The objection to surgical removal is the frequent recurrence in the scar, because the operation on the glands cannot be sufficiently complete, no matter how thoroughly the dissection is carried out. The removal of the submental part of the parotid, the submaxillary and all the glands which metastasize, together with the ligation and excision of the jugular, is no easy task, besides often leaving cancer cells in deeper glands which cannot be reached.

The advantage of radiation is the removal, in most cases, of the diseased cells without producing deformity and contraction, and healing with very little scar formation. Guided by this consideration, the writer believes radiotherapy, by means of radium and the modern roentgen tube,

at present constitutes the best routine treatment of epithelioma, both at the early and late stage, and that this is one place where surgery, and electric coagulation in most instances, should be employed as an adjunct.

I have seen glandular involvement take place quickly following both surgical removal or electric coagulation primarily in sufficient number of cases to justify a preliminary radium treatment to the lip, a large dose of radium over the submental and submaxillary glands, with a thorough course of roentgen treatment over the entire cervical glands of both sides of the neck. Ten or fifteen years ago I nearly always had the local lesion removed surgically, but in the last four or five years I have recommended radiation as described primarily. The end results by so doing have been at least fifty per cent better. By this I do not mean to delay fulguration or surgery indefinitely. I have seen some cases after radiation given in fractional doses when the radiation was persisted in too long.

What has been said about epithelioma of the lower lip will apply to malignancy of the mouth and throat, because it is only a local disease at the beginning and cannot be determined clinically with any degree of certainty. Epithelioma of the mouth and throat are more difficult to treat and the end results are not equal to those of epithelioma of the lower lip. Many of the early lesions are amenable to radium alone, but the adjacent glands should always receive roentgen treatment. Unfortunately a large majority of the cases are not seen until far advanced. A preliminary application of radium in every advanced case is always advisable, but should not be persisted in too long if the disease does not respond promptly. Electric coagulation is often a valuable adjunct with which to follow radium, as it destroys tissue without opening the blood and lymph vessels and prevents dissemination which might occur with a cutting operation. The large amount of carcinomatous tissue which can be destroyed by electric coagulation, without hemorrhage, is an item of great importance, and compels serious consideration by those who have treated many malignant cases. In some cases, after radium has been pushed almost to the caustic stage, it may be advisable to remove the growth surgically. The combination of surgery, radium, roentgen rays, and coagulation will cure more cases of malignancy of the mouth and throat than any one method alone.

Before any one attempts to treat carcinoma of the breast as an anti-operative measure, postoperatively or for palliation, he should make a study of the lymphatic supply and the extensive metastases which are frequently present, even in apparently early cases. Applying a few radium tubes to the breast, axillary and supraclavicular glands or only radiating these areas by the roentgen rays as many are doing, is not treating carcinoma of the breast intelligently. Such radiation does not treat metastases in other parts and might be compared to surgery done twenty-five or thirty years ago. No matter whether radium or the roentgen rays are employed, clinical experience has proved again and again that permanent results mean more than superficially raying the anterior chest wall, axilla, and supraclavicular glands, because metastases are more extensive than this in at least twenty per cent of the early cases, when the diagnosis can only be made by a microscope, and in over eighty per cent when the axillary glands are palpable at the time of operation. We are looking for the best method of raying the widest area, the deepest with the least effect on the skin and the least loss of radiant energy. The writer has adopted the following method and the experience gained from treatment of recurrence has made him increase the areas from time to time.

1. In order to prevent recurrence in the wound and to destroy any foci in lymphatics of the anterior chest wall leading up to the inner clavicular area, the anterior chest wall from the clavicle to an area below the liver should be rayed.

2. The axilla is cross-fired as much as possible and the area below the liver is included. The supraclavicular glands are usually involved from the axillary.

3. The supraclavicular region is divided into four areas: the rays are directed obliquely inwards toward the cervical glands; on another skin area the rays are directed downward through the shoulder toward the axilla; on another obliquely downwards and backwards through the clavicle, and on another obliquely forward from the posterior surface.

4. The suprascapular area more frequently metastasizes. Each should receive a full dose on the affected side, while on the opposite side the subscapular area might be omitted in early cases.

5. The mediastinum should receive treatment both anteriorly and posteriorly through the chest, cross-firing as much as possible. The opposite breast and its main chain of lymphatics should always be rayed.

6. The epigastric region should never be omitted, as this is one of the avenues by which the liver and pelvic viscera metastasize.

In giving the treatment regardless of what form of radiation is employed, sufficient cross-firing must be used so that the glands deeply situated must receive sufficient amount of radiation, otherwise the treatment is incomplete. Experiments have shown that if the glands are to be treated four inches below the surface, since the intensity diminishes from one hundred to fifteen, the actual intensity at the glands is about one-seventh of that at the surface.

It is a demonstrated fact that in lymphatics, where the vessels are of small size, carcinomatous cells do not disseminate nearly so rapidly as where they are of larger size. It has been proved that the lymphatics undergo sclerosis, thus reducing the size of both the lymph nodes and vessels, which in turn reduces the danger of metastases. A cancerous mass, after being rayed, changes in type, becoming more scirrhous, and is rendered much less malignant.

In every case of carcinoma of the uterus, regardless of the stage and whether it is used as a prophylactic measure after operation or in recurrent or inoperable cases, radium should always be used locally, and all the visceral and inguinal glands should be treated by the roentgen rays, cross-firing as thoroughly as is advised for uterine fibroids A study of carcinoma of the uterus from incipiency to the time the liver and other visceral organs become involved in fatal cases, and a careful following up of cases, have shown conclusively that in all cases the combination of radium and the roentgen rays produce the best results in conjunction with the proper surgical treatment. It is only necessary for any one to follow up a number of cases to be convinced that locally rad um is by far the best form of radiation in cancer of the uterus. The mucous membrane of the vagina will tolerate from five to eight times more radiation than the skin over the abdomen, and this alone should induce any clear thinker not to attempt to destroy local carcinoma by roentgenotherapy through the abdomen, as many roentgenologists are doing, when radium is available. A study of carcinoma of the uterus in gynecological clinics, and the Wertheim operation, or a modification of it, will soon convince the radiotherapeutist that treating carcinoma of the cervix and uterus by radium locally will go a stage beyond surgery and cure cases in which no abdominal metastases have taken place. It is a much easier task to treat carcinoma of the uterus locally by radium than to treat the adjacent glands which metastasize. Both are mathematical problems, but the latter is more complex than knowing the roentgen ray equation employed in deep therapy. I do not mean to say that the same accuracy in technic must not be employed, because cross-firing, filtration and the dosage for each case must always be determined when employing radium, depending upon the size of the growth and the space around it.

The results obtained from the surgical treatment of carcinoma of the uterus either emphasize the importance of seeing the cases earlier and of doing more radical operations than have been heretofore performed, or else it suggests the addition of radium or the roentgen rays before we are able to cure a majority of the cases which can be diagnosed clinically.

In conc us on, the combined or selected methods of radium, roentgen rays, and surgery when remova is necessary, to-day provide the on y rational and efficient means of treating malignancy. The consu tant must be thoroughly conversant with principles that have been established, experienced and without prejudice. Sufficient data have been produced n the past fifteen years to give radiotherapy a sound and rational place in the treatment of malignancy. This has been accomplished by the team work of the clinician, pathologist, surgeon and radiotherapeutist. The data are so conc usive that there cannot possibly be an excuse, except through ignorance (and ignorance is no excuse), for experimenting or selecting the wrong method of treatment.

RADIUM COMBINED WITH ELECTROCOAGULATION, SURGERY AND DEEP ROENTGENOTHERAPY IN THE TREATMENT OF MALIGNANT DISEASE*

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RADIUM has been proven of definite value in the treatment of malignant disease. Success has followed its application at the hands of many physicians. The most striking successes have been in the visible and palpable superficial lesions, which are the same kind of cases in which all the other methods of treatment have been the most successful. So, too, surgery, electrocoagulation and roentgenotherapy have proven themselves of distinct and positive value in the cure of malignant disease; but none of these methods are entirely satisfactory. No single method known to science to-day will cure all cases of malignant disease. It is our duty to utilize any of the methods which have been proven satisfactory in each individual case according to the indications and according to the likelihood of success. There are certain types of cases which cannot be expected to get well with any single method of treatment, but which have a reasonable chance of recovery if one or more methods are combined, and I believe that, since no single method of treatment can be depended upon to produce uniform success in all cases, it is our duty to utilize each and every method in combination that will increase the percentage of cures.

For many years most surgeons and all roentgenologists have been recommending postoperative *x*-ray treatment, or, in other words, a combination of surgery and deep roentgenotherapy in the treatment of malignant disease. This postoperative treatment by deep roentgenotherapy is, therefore, a combination of surgery and roentgenotherapy. During the past two years I have been recommending antioperative treatment, with the object of reducing the malignancy of the cells, and thereby preventing or retarding recurrence. By that I mean that deep roentgenotherapy should precede the operation, and as soon as the course of treatment is given, which should not require more than a few days, the patient should be operated upon without waiting for results from the roent-

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genotherapy. This should then be followed by postoperative treatment at an interval of four weeks.

During the past six years I have been combining in a number of cases electrocoagulation, radium, surgery and deep roentgenotherapy, with results which I believe could not have been produced by any single method. The cases which I desire to report under this title serve merely as illustrations of what can be accomplished and how these various methods can be combined to advantage. I am sure that whenever two or more methods can be used in the treatment of a case of malignant disease the chance of permanent recovery will be increased. In other words, by skillful combination of these methods named our total percentage of cures of malignant disease can be increased.

The general uses of radium are being discussed by very competent men, and many cases of malignant disease have been reported cured by radium alone. I shall, therefore, refer to no cases in which I have not combined the use of radium with other methods.

It is with the hope of preventing reinoculation, or extension of the disease, that I have been recommending during the past six years the use of electrocoagulation; and it has been with the hope of reaching the metastases and of destroying any remaining cells that were not removed by the operation, that has led most of us to recommend deep roentgenotherapy as a postoperative measure. Roentgenotherapy cannot be applied, however, to malignant disease located within the cavities. It is in this group of cases that I believe radium fills a peculiar need, and I believe that if radium is applied to malignant disease within cavities, giving it every possible advantage, and if one combines with this, the other well-known methods of curing malignant disease, a greater percentage of these troublesome cases can be cured than has ever been recorded to date. When radium is applied within the cavities it is well known that the chief effect extends approximately only two centimeters in depth. Therefore the radium cannot be expected to reach the outlying cells or the metastases. For this reason deep roentgenotherapy applied externally and added to the effect of the radium internally gives a great advantage. In all cases of carcinoma within cavities, radium and deep roentgenotherapy can be combined. In some cases, all four methods mentioned in the title of this paper can be used to advantage. For the purpose of illustrating the methods of combining these various agents, I desire to report a few illustrative cases.

CARCINOMA OF THE MOUTH

CASE 1.—Mr. J. L. P., age fifty-eight, was referred to me by H. W. Dachtler and H. E. Deemer on January 20, 1913. During ten years he had an epithelioma on the inside of the left cheek, and at the angle of the mouth. He had received some *x*-ray treatment during a number of years, and finally was referred to Dr. Dachtler for *x*-ray treatment. Under Dachtler's care the patient almost recovered, but during his absence the disease developed rapidly and at the time he was referred to me the disease involved two-thirds of the upper lip, half of the lower lip, with a vegetative projecting epithelioma at the angle of the mouth approximately 1 inch in diameter. The disease extended backward on the inside of the cheek to the angle of the jaw. The entire diseased area was destroyed by electrocoagulation and carved out. Deep roentgenotherapy was then applied to the entire left side of the face and the glandular area underneath the jaw. Radium was applied on the inside of the mouth at the angle of the jaw. Under this treatment, all evidence of malignant disease disappeared. At the end of a year, when he seemed to be perfectly well, Dr. Laplace, at my request, did a plastic operation, closed his mouth, and since this time he has remained entirely well. In other words, he has remained well approximately five years, having received all four

kinds of treatment. In this case we combined four methods of treatment—electrocoagulation, deep roentgenotherapy, radium, and finally surgery. I believe that no single method, and probably no two methods, could have produced these results.

CASE 2.—Mr. W. E. R., age forty. On June 10, 1915, the patient was brought to me by Dr. Ernest Laplace as an absolutely hopeless case of malignant disease of the mouth. When he came to us at this time he had carcinoma involving the entire left cheek, the alveolar process and gum on the left side of the superior maxilla, and the entire left lower maxilla, extending through to the angle of the left jaw. The disease extended backwards and involved the anterior pillar of the fauces, and there was a mass of metastatic disease the size of a hen's egg under the left maxilla. In a combined operation at this time we destroyed the malignant disease in the mouth by electrocoagulation, the metastatic glands were dissected out, and the left half of the lower jaw was removed. The entire area was treated by deep roentgenotherapy immediately after the operation, and then at intervals of a month a series of doses were given through twelve different areas. Radium was applied in the region of the left superior maxilla, which seemed to be the area in which the disease was most likely to extend, and most difficult to reach by roentgenotherapy. At the end of six months, the wound had assumed a healthy appearance, and seemed free from malignant disease. An effort was then made to close the mouth by suturing. The first attempt failed. A second attempt failed. After the second attempt the patient had a secondary hemorrhage which was ably controlled by Drs. Gass and Shindle at the patient's home in Sunbury. Finally, on June 9, 1916, exactly one year after beginning treatment, the mouth was successfully closed. It has continued closed and has remained healthy since this time, or exactly four years from the day that he was brought for treatment.

In each of the cases reported above, all four methods of treatment described in this paper were utilized, and each to advantage, and I doubt very much whether the patient could have recovered without the use of the four methods. One cannot, however, always utilize all of them. The following two cases will illustrate the success that may be obtained from the use of two methods, which I believe can always be applied.

Sarcoma within the mouth is difficult to reach satisfactorily by deep roentgenotherapy, and it is not suitable for electrocoagulation. In this group especially radium is indicated, but even in this group of cases, radium can be combined to great advantage with deep roentgenotherapy, as will be illustrated in the three cases which follow:

CASE 1.—Mr. G. E. T., age seventy-one, was referred to me on May 11, 1914, by Dr. H. H. Grace. Six years before he had developed a tumor in the hard palate recognized originally by a dentist, supposed to be due to an ill-fitting plate. Finally the disease had developed to such an extent that it interfered with his breathing. It was generally impossible for him to breathe through his nose. When he came to me for treatment, the tumor involved the entire hard and soft palate, with a growth projecting upwards into the antrum and in the posterior nares, so as to obstruct breathing entirely on the right side, and almost completely obstructing breathing on the left side. There was an ulcerated area on the roof of the mouth approximately the size of a silver dollar. The disease was treated within the mouth by means of the *x*-rays directed through a tube and applied from four different angles. Cross-firing was done from twelve different angles on the outside of the cheek, and radium was applied through the nostrils, and in the region of the posterior nares so far as was possible. He was gone over in this way five times between May 11, 1914, and April 12, 1915, at which time the diseased area was reduced to about one-

sixth of its original size, his general health was good, the ulcer in the roof of the mouth had healed, his breathing was free, and he believed himself to be well. Against my advice he discontinued treatment. He remained free from symptoms, however, until March 26, 1919, when he began to notice the reappearance of the lesion. We have repeated this course of treatment, and there has been marked improvement. I believe that if he persists in the treatment he should recover.

CASE 2.—Mr. J. P. L., age fifty-two, was referred to me by Dr. Geo. C. Stout on April 24, 1917. His condition was very similar to the previous case, excepting that the ulcer had perforated the palate. A Wassermann test was negative. He has been gone over eleven times between April 24, 1917, and January 6, 1919, the line of treatment corresponding to that described in the previous case. At the time of his last treatment, Dr. Stout believed that he was well, and considered seriously the question of doing an operation to close the perforation in the palate. I fear operating in these regions because of the likelihood of the malignant cells being only encapsulated and the operation releasing them, after which the disease is likely to progress. I therefore advised waiting and advised that the perforation in the palate be dealt with by means of a dental plate which would answer every purpose, and I believe could do no harm. If he remains well for a year I believe that an operation to close the palate should be seriously considered.

CASE 3.—Miss M. P., age eighteen, was referred to me by Dr. Wm. Menah, April 19, 1918, with a recurrent sarcoma filling the right posterior nasal space. At the time that she was sent to me there was a triangular tumor about 1½ inches on each side occupying the posterior nasal space, slightly more on the left than on the right. She was given six courses of treatment within six months. Each course involved eight doses of *x*-rays given through eight different portals of entry, one dose being given inside the mouth directed toward the palate. In addition to this 50 milligrams of radium were introduced into the posterior nares as far as the tube could be inserted through the nostril, and allowed to remain there one and one-half hours, and were filtered through ½ millimeter of silver, and a millimeter of rubber. The tumor had completely disappeared at the end of six months, and she has remained well to date, which is fourteen months since beginning treatment, and eight months since the treatment was discontinued.

I believe that surgical excision or destruction by electrocoagulation should not be used on sarcoma unless one can be sure of surrounding and removing all of the disease.

CARCINOMA OF THE ESOPHAGUS

This region I believe also offers a field for combined treatment by means of radium and deep roentgenotherapy. In this group I have no cures and no approximate cures. I have treated several cases, but all were very far advanced; and while I seem to have obtained in all temporary improvement, the ultimate results were bad—that is, failure in getting the patient well. It seems to me, however, that radium should be useful if the capsule is passed directly into the stricture, and allowed to remain there a sufficient time to cause a destruction of the growth; and especially is this true when it is passed under the guidance of the fluoroscope and definitely located within the growth and changed according to the needs. If to this one adds thorough cross-firing through all the angles of the chest, I believe good results should be obtained, though I have none to report.

CARCINOMA OF THE UTERUS

Brilliant results have been reported by Koenig and Gauss, Kelley and Burnham, John G. Clark, Boggs, Frank, and others, in the treatment of carcinoma of the uterus. Therefore radium has proven itself of value in this disease; but with all the successes

that have been obtained there have been many failures, and theoretically at least it would seem, if one associated deep roentgenotherapy applied through various angles or fields of entry surrounding the abdomen, cross-firing upon the disease from every angle possible, that in this way with the immediate or local effect of the radium one should be able to destroy or devitalize the carcinomatous tissue which had extended beyond the reach of the radium when placed within the vagina or the uterus. In this group I have treated, and am treating, a number of cases. I will only refer to one in which the results seem to be especially brilliant.

Mrs. F. J. J., age forty-one, was referred to me by Dr. Barton Cook Hirst October 8, 1918, who found an extensive carcinoma of the uterus, entirely inoperable, involving the cervix and the entire upper portion of the vagina. There was an ulcer 1½ inches in diameter with a crater about ¾ inch deep; the whole area was indurated, and there was extensive infiltration in the pelvis in all directions. Fifty milligrams of radium element, surrounded by ½ millimeter of silver, 1 millimeter of bronze, 3 millimeters of rubber, were imbedded in the ulcerating mass for four days. This was followed by a series of thirty doses of *x*-rays applied through thirty portals of entry in all directions through the abdomen. There were no unfavorable symptoms. At the time of beginning treatment, it required ¼ gr. of morphine daily, the patient suffered excruciating pain, and had continual bleeding. She returned on November 1, 1918, approximately five weeks from the time of beginning treatment. She looked very much better, and was practically free from pain, ate very well, was much stronger. Inspection of the vagina showed a small ulcer or fissure about ¼-inch in diameter from which there was a slight blood discharge. Almost no crater was left, the general tissues of the pelvis were soft, the cervix was freely movable and all the previously described malignant tissue was replaced by scar tissue. It seems hardly believable that so much improvement could have occurred in so short a time. The patient was then given a second course of deep roentgenotherapy, the radium was reapplied for twenty-four hours, and there was good reason to expect a recovery in this patient based upon the results obtained. The patient went home, and a few weeks later developed influenza and died of pneumonia.

CARCINOMA OF THE BLADDER

Carcinoma of the bladder has not been treated with brilliant results by any single method. I have treated several cases by introducing radium into the bladder through a rubber catheter, and applied *x*-rays externally, cross-firing through the abdominal wall, but in none of these have I obtained any more striking results than temporary improvement. In two there was a combination of surgery, electrocoagulation, radium and roentgenotherapy; and I believe the patients will get permanently well. One was treated two years ago, and the second about three months ago. The second case was treated by Dr. Laplace and myself, according to my ideal of methods.

CASE 1.—Mr. X., age thirty-seven, was referred to me July 3, 1917, by Dr. T. E. Wills. The patient had suffered from hematuria for over a year but had not had a a cystoscopic examination until a month before he was referred to me. Two weeks before he returned to me the patient had been operated upon by Dr. Nassau for carcinoma of the bladder. The tumor was the size of a small orange. The entire base of the bladder was infiltrated, and at the time that he was referred to me this area was still indurated. Six doses of *x*-rays were applied through the opening into the bladder, twelve doses applied anteriorly through the abdomen, and two posteriorly. Then radium was introduced into the bladder, 25 milligrams, for forty-eight hours. At the end of four weeks examination of the bladder showed a recurrence of disease

with bleeding papillomata, which seemed to be malignant. The patient was then anesthetized, and all these bleeding areas and all areas of induration were destroyed by electrocoagulation. Radium was introduced into the bladder, 25 milligrams, for forty hours. Deep roentgenotherapy was then used through nineteen different areas cross-firing upon this diseased area. During the next month, or third series of treatment, the patient received sixteen doses of *x*-rays, and the 25 milligram specimen of radium was applied in the bladder for eighteen hours. The patient received four series of treatment in all, and on September 14, 1918, Dr. McKinney made a cystoscopic examination, found the bladder free from tumor, and advised closing the cystotomy wound. This operation was done, and the patient has remained well to date, or approximately two years from the time of his original operation. He therefore has a reasonable hope of remaining permanently well.

CASE 2.—Mr. E. S. J., age fifty-two, was referred to me April 7, 1919, by Dr. Ernest Laplace for an examination of his bladder on account of hematuria. I injected the bladder with air and found a papillomatous tumor on the left side of the bladder, about 2 inches in diameter, irregular in outline, and apparently having a broad base. These conditions led me to believe that it was carcinomatous. After consultation with Dr. Laplace, we agreed upon a combined treatment. We did a cystotomy, and through the cystotomy wound I destroyed the entire tumor by electrocoagulation, guiding and judging the destruction by my finger in the rectum. This served as a guide against destroying the bladder wall and against making a fistulous opening into the rectum. I placed 100 milligrams of radium in a half millimeter of silver, a millimeter of bronze, and 3 millimeters of rubber. This was placed directly over the area which had been diseased. The bladder was then packed with sterile gauze, and this radium was allowed to remain for twenty hours, making twenty milligram hours of radium treatment in which we made use almost exclusively of gamma rays. We next gave the patient a course of twenty doses of deep roentgenotherapy, applying it through twenty different areas, cross-firing upon the bladder area and the lymphatic glands leading therefrom. As a result of this treatment, which I consider ideal, there have been no unfavorable symptoms. There was no reaction after the operation. In about ten days the urine flowed clear, and for the most part drained through the urethra. The time, of course, is too short to judge the result of this case, and it is not intended as a report of results, but of what I consider the ideal method of treatment in tumors of the bladder.

CARCINOMA OF THE RECTUM

Treatment of carcinoma of the rectum is probably the most unsatisfactory and the least successful of all carcinomata in any part of the body. It is unsatisfactory, first, because the cases usually come late, after the disease has extended a considerable extent into the bowel, and second, because metastasis takes place rather early. I have attempted the treatment of several cases by introducing a capsule of radium within the constriction caused by the carcinoma, and cross-firing externally by deep roentgenotherapy; but in no case have I obtained cures. In several cases I have obtained amelioration, and for a time I believed the patient was going to get well, but ultimately I was disappointed.

PITUITARY TUMOR

The symptoms of pituitary tumors develop very slowly, and their effects are often of a permanent character, so that one cannot judge very accurately as to the results obtained from any particular kind of treatment, excepting in so far as the symptoms do not progress. I can refer to but one case, which is reported more by way of illustration as to how radium and

deep roentgenotherapy can be combined in the treatment of this disease.

Mrs. W. S. J., age thirty-two, was referred to me for *x*-ray treatment of the pituitary region November 28, 1917, by Dr. Chas. Frazier and Dr. Thomas Holloway. The patient had had pituitary disease for some time, with the chief symptom of headache and loss of vision. She was operated upon April 1, 1916, by Dr. Cushing. At the time that she was referred to me she was suffering from a recurrence of all the symptoms, which had increased rapidly. Dr. Cushing had previously done a transsphenoidal operation. The eyes returned to normal within two weeks after Dr. Cushing's operation, and the headaches were relieved somewhat, but not entirely. During the past five months the patient had had recurrence of the eye symptoms—at least the eyes were worse than at the time of the previous operation. In addition to this she had the characteristic symptoms of acromegalia. She had taken extract of pituitary and thyroid extract and suprarenalin during July, August and part of September, but with no good results. She felt that her eyes had become rapidly worse since stopping the treatment. *X*-ray examination showed a great enlargement of the sella turcica, the size being at least an inch in the anteroposterior direction. The height of the posterior clinoid process was approximately one inch, the posterior clinoid process being pushed backwards. Eight doses of *x*-rays were given, cross-firing upon this disease November 28 and December 1, 1917; and she was given 300 milligram hours of radium on December 4, 1917. She was given an additional eight doses of *x*-rays on December 18th. This course of treatment was repeated in January, 1918. A third course of treatment, of a similar nature, was given during April. On May 22, 1918, Dr. Holloway reported that her condition had remained stationary during the past three months; her headache had improved. October 3, 1918, Dr. Holloway wrote that the patient's eyes continued to do well, and that when examined the week previously she had normal vision in both eyes. The fields of vision showed no further change excepting that the slight scotoma that was present in each eye had entirely disappeared, so he reported her condition improved.

This brief review of cases does not permit us to draw any definite conclusion at the present time, and is made more with the idea of showing how different methods of treatment can be combined to cure a group of cases that are generally considered hopeless.

DISCUSSION

Dr. William L. Clark, Philadelphia.—The value of the methods related by Dr. Pfahler is so common-sense and so proven by experts that the discussion of the subject in general is hardly necessary. We are in complete accord on this subject, with the exception of a few minor details. All I shall attempt is an amplification of the things that he has brought out. In order that I may utilize to the best advantage the time at my disposal I will ask that a few pictures of my own may be thrown upon the screen. I have worked more with the electrothermic methods than with the others, but I am treating more cases with radium every day.

Dr. Isaac Levin, New York.—I believe we all realize that Dr. Pfahler is a pioneer in this work. For more than a decade he has been fighting single-handed for what the whole Society now intends to do—destroy prejudice and inspire confidence among surgeons in this ray-therapy. I believe that owing to Pfahler's work there is more confidence in this method among the surgeons in Philadelphia than in any other town in the country.

I believe with him that we ought to combine all of the four methods, and more. I also believe that electric surgery, as well as the knife, is only adjuvant to the ray-therapy. Only by subsequent persistent employment of the latter method can the best results be obtained. No matter how completely we destroy the growth by surgical measures there are always a few cancer cells left behind. I have gathered evidence to show that there is never a perman-

ent cure in cancer. We only prolong life. Twenty and even thirty years later there may be a recurrence of the same type of cancer after a radical operative removal of the primary growth. The arrest of the development of the remnants of the cancer for a number of years by the aid of postoperative radiotherapy presents a sufficient therapeutic accomplishment.

As regards the difference between *x*-ray and radium therapy, I do not believe that it is only a question of convenience. There is a certain qualitative difference between these two agents. Radium burns and *x*-ray burns are clinically undoubtedly different conditions. Moreover, even from the standpoint of convenience it is not only tumors in the cavities which are more favorably influenced by radium. Small tumor masses, as for instance small local recurrences of carcinoma or involvements of lymph glands, are far more readily influenced by radium than by *x*-rays. I have had many such cases in which *x*-rays failed but radium succeeded. But generally in cases of malignancy we ought to employ all the methods in our therapeutic armamentarium, and then only will the greatest success be obtained.

Dr. Henry Schmitz, Chicago.—One important point brought out by Dr. Pfahler which I think of great value, is the interim to be observed between radium treatment and operation. He mentioned that the interval should be very short, possibly the next day or two days. It is almost five years since we have instituted the combined method of operation and *x*-ray and radium therapy. We have had many cases, and our experience differs somewhat from Dr. Pfahler's. If we operate a patient and treat him with radium rays immediately or shortly before the operation, we have observed a great many septic infections, due to lowered resistance, local as well as systemic. On the other hand, if we wait for two or three weeks, wait until the septic complications subside, but before the connective tissue stage due to the reaction from the radium is completed, we see our patients through the operation without fear of sepsis. We never should wait until the radium and roentgen ray reaction is completed because it is difficult to operate on a patient with heavy scar tissue in the pelvis. Should hemorrhage be profuse we arrest it by the application of heat, or put on clamps which are left for thirty-six hours, when they are carefully removed. Dr. Pfahler's paper is excellent, and we all realize that whenever we hear anything from him we hear the law of the application of rays. His work has been eminent and has stimulated the rest of us to better effort.

Dr. George E. Pfahler.—There is little to close in the discussion. I would like to emphasize another point in connection with the subject brought up by the President with regard to ante-operative treatment. I think his observations in regard to all postoperative treatment of carcinoma in the bowels is probably correct, but in a number of cases of carcinoma of the breast we applied the rays immediately after the operation in the open wound and had no bad results. This would not hold so well in treatment of pelvic conditions because there we are more apt to get constitutional symptoms and it is probably a fact that it is best to wait awhile. That is the postoperative treatment.

In respect to the ante-operative treatment I have had no objections from any of the surgeons regarding it. In carcinoma of the breast not only do I think that we ought to do ante-operative treatment, but I think every case should be examined by the *x*-rays preceding operation to determine metastases in the lungs and chest. Last Friday I had two cases of carcinoma of the breast sent to me and I found not only metastases in the lungs and mediastinum, but in the vertebræ, preceding the operation. You can understand that ante-operative treatment or any other form of treatment would not be a success in such a case. If we combine the radiotherapy with operation the patient's life may be prolonged but he will not get well. I have had patients live for two or three years, but never with metastases of the bone have they gotten well.

RARER TYPES OF FRACTURES

BY ALBERTUS COTTON, M.D.

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IT is a fact well known to surgeons and to roentgenologists that practically all fractures can be grouped into types. With the commoner types most physicians and surgeons are familiar. Among these may be mentioned Colles' fracture, Pott's, fractures of the shaft of the bone, fracture of the surgical neck of the humerus, fracture of the olecranon, "T" fractures at the elbow and knee, fracture of the neck of the femur. The pathology, clinical signs and symptoms, together with the methods of treatment of these fractures, have been taught in our medical schools for more than a century.

The history of the development of our knowledge of the common types of fractures is interesting. It shows that our knowledge was first obtained from clinical observation and anatomical dissections (museum specimens). Later, with the beginning of the era of asepsis, it was greatly increased by open operation. Finally the *x*-ray was discovered to aid us in our knowledge and to show the error of many of our previous conceptions of fractures. It is not too much to say that the knowledge gained by the use of the *x*-ray has revolutionized our conception of fractures and that it has been necessary to rewrite our text-books. Accurate knowledge of detail of fractures has taken the place of the opinion of the authorities of the text-books. Many of the older teachings have been shown to be erroneous. It is now known, for example, that fractures of the carpal and tarsal bones are not uncommon. Many so-called sprains are shown to be fractures, e.g., impacted fracture of the neck of the femur, fracture of the head of the radius, fracture of the greater tuberosity of the humerus, linear fracture of the bones near large joints—as chauffeur's fracture, fracture of the external malleolus of the ankle, linear supracondyloid fracture of the humerus, etc. Some of the old classical fractures have either been set aside completely or found to be very uncommon and many new types have been added. Fracture of the anatomical neck of the humerus is known to be a rare condition. Fracture of the greater tuberosity is exceedingly common. The old "T" fractures of the elbow and knee, while they do occur, are not so common as fractures above the condyles or through one or both.

An example of the increased detailed knowledge obtained by the *x*-ray in our known types of fractures might be illustrated by the history of Colles' fracture. The most common type of fracture of the lower end of the radius was first described by the Irish surgeon, Colles, in 1814. Colles described his fracture as a fracture of the lower end of the radius, one and a half inches above the articulation. He first described the condition in order to differentiate from dislocation of the wrist. Twenty years later, impacted Colles' fracture was described. *X*-ray examination of a great many of these so-called Colles' fractures have shown that there are a great number of fractures of the lower end of the radius quite different from the fracture first described by Colles. We know that fracture of the lower end of the radius is often associated with that of the styloid of the ulna, that comminution frequently occurs, that the line of fracture varies in its relation to the articular surface, that the displacement, while usually backward, may be forward (reversed Colles').

The skilled surgeon in most cases is able to recognize the common types of fractures by classical signs without the *x*-ray. He uses the *x*-ray for detailed information as to the line of fracture, presence or absence of comminution, direction of deformity, etc.—information valuable in aiding reduction. After reduction he uses

the *x*-ray as a check upon his work and to ascertain whether or not the reduction has been maintained. The surgeon who interprets his own *x*-ray plates can often picture in his mind from his clinical examination just what the *x*-ray will show; in other words he can visualize an *x*-ray plate for the particular fracture under consideration. This is especially true of the commoner types of fractures, Colles', Pott's, etc. The same, however, cannot be said of the rarer types, as few individual surgeons, except those who see a great number of fractures, have the opportunity to see these types of fractures often enough to recognize them at once and to be able to visualize them on the *x*-ray plate. The object of this paper is to call the attention of the roentgenologists to certain fractures with which they are familiar and to emphasize the importance of recognizing these fractures as types.

They are types of fractures in the same sense that Colles' and Pott's are types. They have a definite etiology, characteristic signs and symptoms, and can be as definitely diagnosed and visualized on the *x*-ray plate as the more common types. The active roentgenologist who makes *x*-ray examinations of fracture cases for many surgeons has an excellent opportunity for studying these types and for educating the profession to recognize them. If roentgenologists would devote more time to the study of fracture cases from the point of view of diagnosing types of fractures, their work would be of far greater value to the surgeons who refer their work to them, to the patient and to the general profession. The *x*-ray diagnosis of types of fractures is the most important part of the roentgenological examination and should precede any minute description of line of fracture or displacement. If roentgenologists would begin in their reports by saying, for example, "this is a base of the fifth metatarsal" or "a tip of the external malleolus" or "a linear supracondyloid humerus fracture" and then proceed to give in detail directions of the line of fracture, deformity, etc., these fractures would soon become recognized as types just as Colles' and Pott's fractures are now recognized. These rarer fractures should be considered types for the reason that, with a definite etiology, these same fractures occur repeatedly, and they have characteristic signs and symptoms which enable the surgeon who is familiar with types to make the diagnosis without the *x*-ray. Most skilled surgeons are able to diagnose these rarer fractures either with or without the *x*-ray, but how many of the general profession recognize them as distinct types?

I feel sure that the observing roentgenologist has the opportunity, if he will avail himself of it, to educate the profession in general to recognize these rarer fractures as definite types. It is not possible in a limited article to describe all of the rarer types of fractures. It will only be possible to give illustrations of some of the most characteristic. Some of the fracture types described and illustrated below occur very frequently and are well known to the experienced surgeon; others, while not common, cannot be classed as rare; others are, relatively speaking, rare types. Most roentgenologists will recognize old friends in these illustrations. Probably none of the illustrations shown are new to the active roentgenologist. If, however, I succeed in emphasizing the fact that these fractures are types, the object of the paper will be achieved.

No. 1.—Knuckle Fracture (fracture of a metacarpal bone just behind the head). This type is very common.

Etiology.—Blow on knuckle.

Signs and Symptoms.—Knuckle drop; head of metacarpal in palm; lower end of distal fragment on dorsal surface; local tenderness; shortening; mobility and crepitus. The *x*-ray is invaluable in differentiating this fracture from dislocation of the metacarpo-phalangeal joint and from old fracture deformity. (Fig. 1.)

No. 2.—Fracture of the Base of the First Metacarpal (Bennett's or stave fracture).

Etiology.—Direct violence, blow against base of thumb, causing backward and upward displacement.

Signs and Symptoms.—Swelling; local tenderness; loss of function; may be crepitus and abnormal mobility. It is to be

FIG. 1. KNUCKLE FRACTURE (FRACTURE OF A METACARPAL BONE JUST BEHIND THE HEAD).

differentiated from dislocation of the carpometacarpal joint for which it is frequently mistaken by the inexperienced. Dislocation is very rare. This type of fracture occurs rather frequently. The *x*-ray is very useful

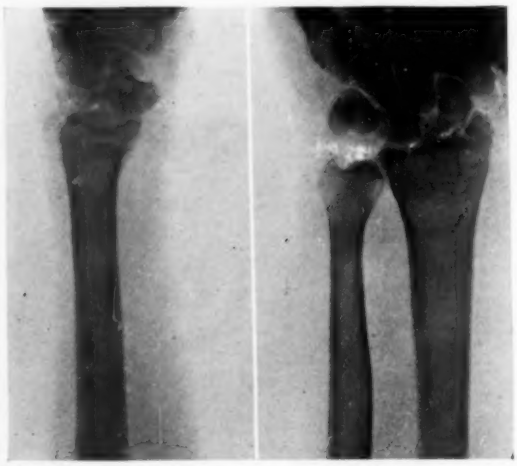

FIG. 3. FRACTURE OF THE SCAPHOID AND DISLOCATION OF THE SEMI-LUNAR (SEE THIS PARTICULAR CASE—FRACTURE OF THE STYLOID OF THE RADIUS ALSO).

in differentiation and in determining the amount of displacement or degree of impaction. (Fig. 2.)

No. 3.—Carpal Fractures. The *x*-ray has shown that fractures and dislocations of the carpal bones do occur and that fracture of the scaphoid especially (with or without dislocation) is not an uncommon injury.

FIG. 2. FRACTURE OF THE BASE OF THE FIRST METACARPAL.

Etiology.—Fracture of one or more carpal bones may be due to severe direct violence and associated with fracture of the radius and ulna. Fracture of the scaphoid is caused by a fall on the pronated hand. There are several varieties, namely: (a) fracture without displacement; (b) fracture (two or more fragments) with displacement; (c) fracture with displacement

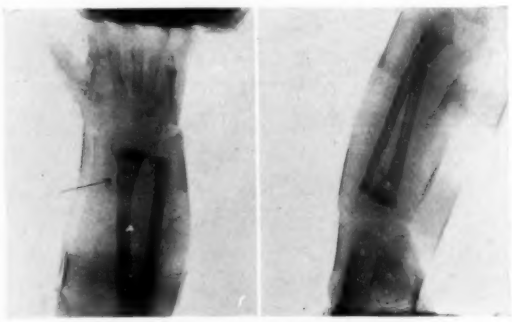

FIG. 4. GERUSTICH'S OR SUBPERIOSTEAL FRACTURE OF THE LOWER THIRD OF THE RADIUS.

of fragment and associated dislocation of the semilunar. The latter combination (fracture of the scaphoid with dislocation

of the semilunar) is seen often enough to be classed as a definite type, being second in order of frequency of the carpal injuries. Incomplete fracture of the scaphoid is the most common variety.

Signs and Symptoms.—Swelling over the palmar and dorsal surfaces of the scaphoid and in the snuff box; limitation of wrist motions, especially abduction and extension. In old cases with displacement there is well marked thickening. The *x*-ray is indispensable in accurate diagnosis of this fracture. Both the two-way right-angle views and stereoscopic plates should be taken. A good working knowledge of osteology on the part of the roentgenologist or the surgeon who interprets his own plates is necessary to interpret this fracture correctly. Care should be taken not to mistake the normal rarefaction of the neck of the scaphoid for fracture. The writer has seen this mistake made several times. A good negative of both wrists in an anteroposterior position (Codman's method) *may* be sufficient to show a fracture of the scaphoid, but it is entirely inadequate to show possible associated dislocation of the semilunar or os magnum or the amount of displacement of the fragments. In "fracture-of-the-scaphoid-dislocation-of-the-semilunar" type, the semilunar usually goes forward with the radius and one or both scaphoid fragments, while the os magnum is displaced to the dorsal surface. A less common injury is complete forward dislocation of the semilunar from both radius and os magnum, with or without fracture of the scaphoid. (Fig. 3.)

FIG. 5. FRACTURE THROUGH THE ARTICULAR SURFACE OF THE HEAD OF THE RADIUS.

FIG. 6. FRACTURE OF ULNA, UPPER THIRD, AND FORWARD DISLOCATION OF THE RADIUS.

No. 4.—Greenstick or Subperiosteal Fracture of the Lower Third of the Radius. This is a rather common type of fracture in children. The same fracture is seen in the ulna and also in both radius and ulna together. The fracture of the radius, however, is seen more frequently in the *x*-ray laboratory. It may be greenstick with

deformity or sub-periosteal with very little deformity.

Etiology.—Fall on hand.

Signs and Symptoms.—Pain and swelling; local tenderness; more or less deformity; absence of crepitus. The *x*-ray should be used to differentiate from Colles' or separation of the lower epiphysis of the radius, and to show the exact deformity. (Fig. 4.)

No. 5.—Fracture of the Head of the Radius. Fracture of the head or neck of the radius is one of the fractures which has been rescued from the sprain group by the *x*-ray and is now known to be a not uncommon injury.

Etiology.—Either direct violence, or fall on the pronated hand with the elbow extended.

Signs and Symptoms.—Limitation of pronation and supination with slight limitation of flexion and extension; swelling over the upper end of the radius. The fracture may be in the neck, below or above the orbicular ligament, or in the head. The variety shown in the illustration is fracture through the articular surface of the head. The signs and symptoms of this variety are limitation of pronation and supination; tenderness over the head without deformity; swelling between the head of the radius and the external condyle due to effusion in the joint. A positive diagnosis can be made only from the *x*-ray plate. (Fig. 5.)

No. 6.—Fracture of the Ulna, Upper Third, and Forward Dislocation of the Radius. This is a definite type which is not often seen.

Etiology.—Usually direct violence—blow or fall upon back of elbow below joint.

Signs and Symptoms.—The usual signs of fracture of the upper third of the subcutaneous ulna are present with the prominent head of the radius in front of the outer side of the joint. The lateral *x*-ray plate shows the condition best. Although it is out of order in this communication, the writer cannot resist writing something concerning treatment. Bad end results are seen not infrequently in this type of fracture. The head of radius may be unreduced or the fractured ulna ununited. These old cases require operative treatment, either resection of the radius or wiring of the ulna, sometimes both. Proper treatment of the recent injury will, in the majority of cases, prevent bad results and give good function. They should be treated by first reducing the dislocation of the radius and adjusting the ulna to as good position as

FIG. 7. LINEAR SUPRACONDYLOID FRACTURE OF THE HUMERUS IN CHILDREN.

possible and then placing the elbow in position of acute flexion. This position maintains the head of the radius reduced and through the tension of the deep fascia of the forearm caused by pull of the triceps and leverage upon the lower portion of the ulna, reduces overriding and maintains efficient approximation of the fractured

bones. If this method of treatment is carefully carried out, resection of the radius or wiring of the ulna will seldom be necessary. (Fig. 6.)

No. 7.—Linear Supracondyloid Fracture of the Humerus. Supracondyloid fracture of the humerus is probably the most common type of elbow fracture in children. The complete fracture presents such characteristic signs that the experienced surgeon has very little difficulty in recognizing the fracture without the *x*-ray. The variety of fracture shown in the illustration—linear supracondyloid fracture of the humerus—is one that can only be diagnosed by a good *x*-ray plate. The line of fracture is transverse and may be only a crack in the bone. This variety is not very rare.

Etiology.—Blow or fall on the elbow in hyperextension.

Signs and Symptoms.—Swelling in front and behind over the lower end of the humerus; local tenderness in the same location; limitation of complete flexion and extension; pronation and supination normal; neither crepitus nor abnormal mobility present. With these signs one can often visualize a correct *x*-ray diagnosis before the plate is developed. (Fig. 7.)

No. 8.—Subperiosteal Fracture of the Upper End of the Humerus in Children.

Etiology.—Fall on hand with arm abducted so that the strain falls upon the upper end of the humerus rather than upon the lower end or the head of the radius.

Signs and Symptoms.—Pain referred to the deltoid region; inability to abduct the arm; tenderness over the upper end of the shaft of the humerus; disinclination to use the arm; no crepitus or abnormal mobility. These signs in children should always excite suspicion of this type of fracture. A positive diagnosis can only be made from the *x*-ray plate. (Fig. 8.)

FIG. 8. SUBPERIOSTEAL FRACTURE OF THE UPPER END OF THE HUMERUS IN CHILDREN.

FIG. 9. FRACTURE OF THE GREATER TUBEROSITY OF THE HUMERUS.

No. 9.—Fracture of the Greater Tuberosity of the Humerus.

Etiology.—Direct violence or muscle pull by the external rotators, which are attached to the greater tuberosity.

Signs and Symptoms.—Loss of external rotation, tenderness over the greater tuber-

osity; sometimes thickening; rarely crepitus; head of humerus moves with the shaft. A positive diagnosis of this fracture, when only a small portion is broken and

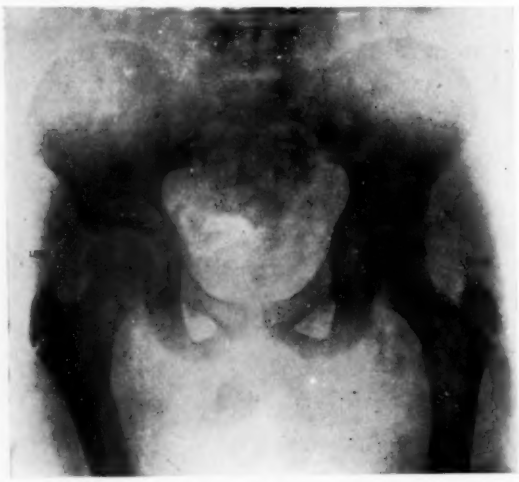

FIG. 10. FRACTURE OF THE NECK OF THE FEMUR NEAR THE EPIPHYSEAL LINE.

not widely separated, can be made only by the *x*-ray plate. (Fig. 9.)

No. 10.—Fracture of the Neck of the Femur in Children. This type differs in many respects from the same lesion in adults.

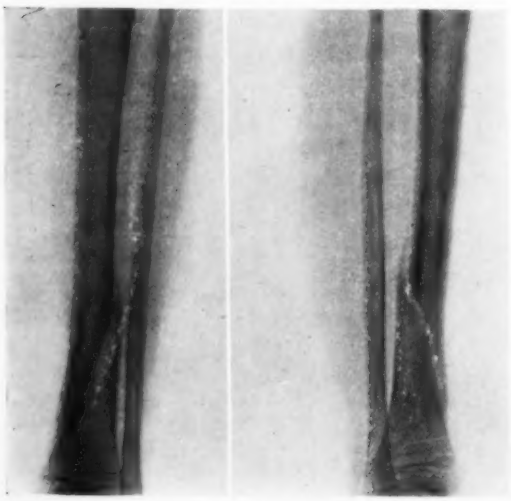

FIG. 12. OBLIQUE FRACTURE OF THE SHAFT OF THE TIBIA IN CHILDREN.

It is caused by a fall on the buttock, trochanter or feet. There is usually severe pain and loss of function of the hip for a short time, after which the patient may walk about with very little immediate disability except a slight limp. They are often

FIG. 11. SEPARATION OF THE LOWER EPIPHYSIS OF THE FEMUR.

treated as sprains. The *x*-ray plates show a fracture that is often partial or green-stick and may be near the epiphyseal line. The later results are scoliosis, bad limp with limitation of abduction. These latter symptoms are caused by coxa vara and shortening. In the case shown in the illustration there was an inch and a half actual shortening caused by coxa vara and epiphyseal injury. (Fig. 10.)

No. 11.—Separation of the Lower Epiphysis of the Femur. This formidable but fortunately rare type is one with which all experienced surgeons are familiar.

Etiology.—Forcible extension of the knee.

Signs and Symptoms.—Shock; great injury to the soft structures; disturbed circulation from injury to the large vessels or nerves; characteristic deformity. The epiphysis with the thigh is thrown forward and the lower end of the shaft of the femur lies in the popliteal space. The *x*-ray should be used to differentiate from supracondyloid or "T" fractures of the femur and dislocation of the knee joint and to determine the exact character of the displacement. The illustration shows the most common deformity. (Fig. 11.)

FIG. 13. FRACTURE OF THE FIBULA, LOWER THIRD, AND SEPARATION OF THE LOWER EPIPHYSIS OF THE TIBIA.

No. 12.—Oblique Fracture of the Shaft of the Tibia in Children. This fracture of the lower third of the tibia in children is a definite type and presents certain characteristics which differ from the same fracture in adults. Localized tenderness and swelling with loss of function may be the only signs. A history of injury may not be obtained. The *x*-ray plates will show an oblique fracture of the tibia usually at the junction of the middle and lower third. The fracture may be linear or complete

FIG. 14. LONGITUDINAL FRACTURE OF THE TIBIA WITH FRACTURE OF THE FIBULA, LOWER THIRD, AND POSTERIOR DISPLACEMENT OF THE ASTRAGALUS.

with very little displacement. The writer has on several occasions seen these cases diagnosed sprain, contusion or periostitis. The *x*-ray will clear up the diagnosis and should always be used when a child pre-

FIG. 15. FRACTURE OF THE BASE OF THE FIFTH METATARSAL.

sents a painful and swollen leg with disinclination to weight-bearing, regardless of a history of injury or of other signs of fracture. (Fig. 12.)

No. 13.—Fracture of the Fibula, Lower Third, and Separation of the Lower Epiphysis of the Tibia. This is a definite type. It is the Pott's fracture of children. It has the same etiology, signs and symptoms as Pott's in adults except displacement of the astragalus and tearing of the internal lateral ligament, which do not occur in this injury. The illustration shows the characteristic deformity. (Fig. 13.)

No. 14.—Longitudinal Fracture of the Tibia with Fracture of the Fibula, Lower Third, and Posterior Displacement of the Astragalus. This is a rare type of Pott's fracture. It is a very difficult fracture to reduce properly and to retain the reduction. The illustration shows a two-year-old case of unreduced fracture of this type with healing of the fibula fracture and a new joint formed between the astragalus and the posterior portion of the lower end of the tibia at the site of the longitudinal fracture. This patient was walking on crutches two years after the injury and required operative treatment to correct the deformity. (Fig. 14.)

No. 15.—Fracture of the Base of the Fifth Metatarsal. This fracture is a definite type and is seen frequently. It was first described by Robert Jones in 1902. Although this is a common fracture few of the surgical text-books or special books on fractures give a description of it.

Etiology.—Inversion of the foot causing cross-strain against base of adjacent metatarsal bone and pull upon the peroneus brevus and tercius muscles. The fracture may be linear through the bone, anterior to the base, or an avulsion of posterior tip.

Signs and Symptoms.—Swelling; localized tenderness over site of fracture; ecchymosis. Patients are able to walk but have severe pain and are lame. They usually go to the doctor for treatment of sprained ankle. The *x*-ray plate shows the characteristic appearance shown in the illustration. (Fig. 15.)

CASE OF FUSED KIDNEYS

BY PEER M. LUND, M.D.

Mt. Sinai Hospital

NEW YORK CITY

THIS case of complete fusion of the kidneys was observed in the routine examination of the ureters with shadow catheters to locate a calculus, and afterwards proved by thorium injection.

The patient was a Russian, twenty-four years old, with a history of hematuria, dysuria and lumbar pains of two years' duration. Otherwise history was negative.

Physical examination was negative.

Cystoscopic examination showed the bladder and the ureteral orifices normal, and both ureters allowed passage of catheters for 30 centimeters. While the right kidney showed normal secretion and no "indigocarmin" in 30 minutes, the left kidney showed a decrease in the amount of urine and a fair "indigocarmin" in 15 minutes.

The first roentgen ray examination

FIG. 1.

showed a concretion, smooth and regular, the size of a nut, in the left lumbar region on a level with the 4th lumbar vertebra. (Fig. 1.) The kidney appeared markedly ptosed, and the concretion was diagnosed as located in the pelvis of the left kidney.

A second roentgen ray examination, with shadow catheters, showed the catheters leaving the right and left orifices of the bladder normally, but at the right sacro-iliac synchondrosis the right catheter turned over toward the left, and close to the left transverse process of the 4th lumbar vertebra it stopped just laterally to the calculus, while the catheter inserted in the left ureter continued up as far as the twelfth left rib. (Figs. 2 and 3.)

FIG. 2.

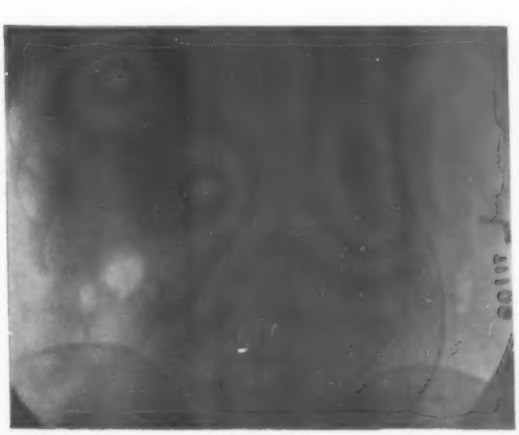

FIG. 3.

A third roentgen ray examination, with injection of thorium into what was supposed to be the left ureter, showed the thorium to fill up what appeared to be a normal looking pelvis in the region of the twelfth left rib; the ureteral opening of the pelvis faced to the left. (Fig. 4.) The roentgen ray diagnosis was made of fusion of the kidneys with a concretion in the lower pole of what appears to be the pelvis of the right kidney.

FIG. 4.

The operative findings were enlarged kidney on the left side, representing a fusion of the left and right kidneys. The kidney was constricted at the junction of the middle and lower thirds. Both pelves came off anteriorly and the ureter of the upper pelvis passed anteriorly to the lower pole. The vessels of the lower pole came off from either the left common ilia or external iliac arteries. In the lower part was present a stone, about the size of a small nut, which was easily released.

The recovery was uneventful.

SOME EXPERIMENTS WITH COOLIDGE TUBES

BY CHARLES L. MARTIN, E.E., M.D., AND GEORGE W. HOLMES, M.D.

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BOSTON, MASS.

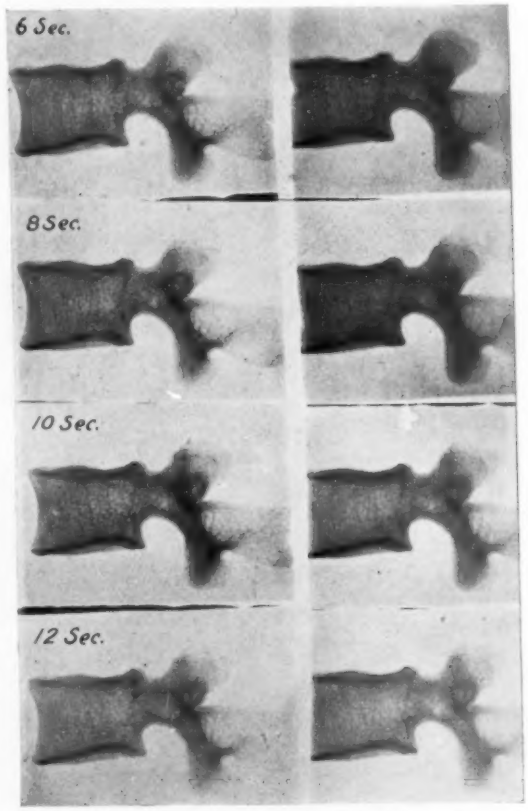
THE characteristics of the Coolidge tube have been carefully studied and described by such well qualified scientists as Dr. Coolidge and Dr. Shearer. The experiments set down in this article do not bring out any new points. They were performed merely with the idea of showing graphically some of the laws governing the operation of the various types of tubes. They have proved of some value in the selection of the proper focal spots for various kinds of work.

In testing out the radiographic results obtainable under varying conditions it is desirable to use some sort of test piece repeatedly. Such a test piece was prepared by imbedding a lumbar vertebra in a block of paraffin four and five-eighths inches thick. This block gave a radiogram practically identical with that obtained with a bone imbedded in living tissues. A piece of screen wire placed on top of the block was of great value in estimating differences of definition. In each experiment all of the exposures were made on one plate so that differences of development could not occur. A Snook transformer served as the source of energy. The different tubes were put into the tube stand one after another and the same apparatus used for all of the work.

EXPERIMENT NO. I

Object.—To study the influence of the size of the focal spot on photographic effect.

Parallel sets of radiograms of the test block were made, using the broad focus tube for one and the fine focus 10 milliampere radiator tube for the other. Both tubes were operated at a target distance of 26 inches with a current of 10 milliamperes and a 5-inch parallel gap. The exposure time was varied. Fig. I shows the results obtained. So long as the exposure time, machine settings, and tube distance were the same the photographic effects produced by the two tubes were approximately the same, regardless of the difference in the size of the focal spots. The



10 MA. RADIATOR TUBE BROAD FOCUS 7" BULB

FIG. 1. A COMPARISON OF BROAD AND FINE FOCUS TUBES AT A 26" TUBE DISTANCE EACH CARRYING 10 MILLIAMPERES WITH A 5" PARALLEL GAP.

slight differences in density observed in the eight second and ten second sets may have been due to slight errors in timing, since a pendulum was used for this purpose. This experiment also illustrates the wide difference in detail obtained with broad focus and fine focus tubes when they are operated

at the same distance. This difference may be eradicated by varying the tube distance of the broad focus tube.

EXPERIMENT NO. 2

Object.—To determine the effect of tube distance on the definition obtained with a broad focus tube operated at a 5-inch gap and carrying 80 milliamperes.

A series of exposures were made with the broad focus tube at different tube distances. Fig. II shows some of the radiograms obtained. As the distance between the target and the plate was increased the definition improved steadily. At 5 feet the detail was practically as good as that obtained with the 10 milliampere radiator tube at 26 inches.

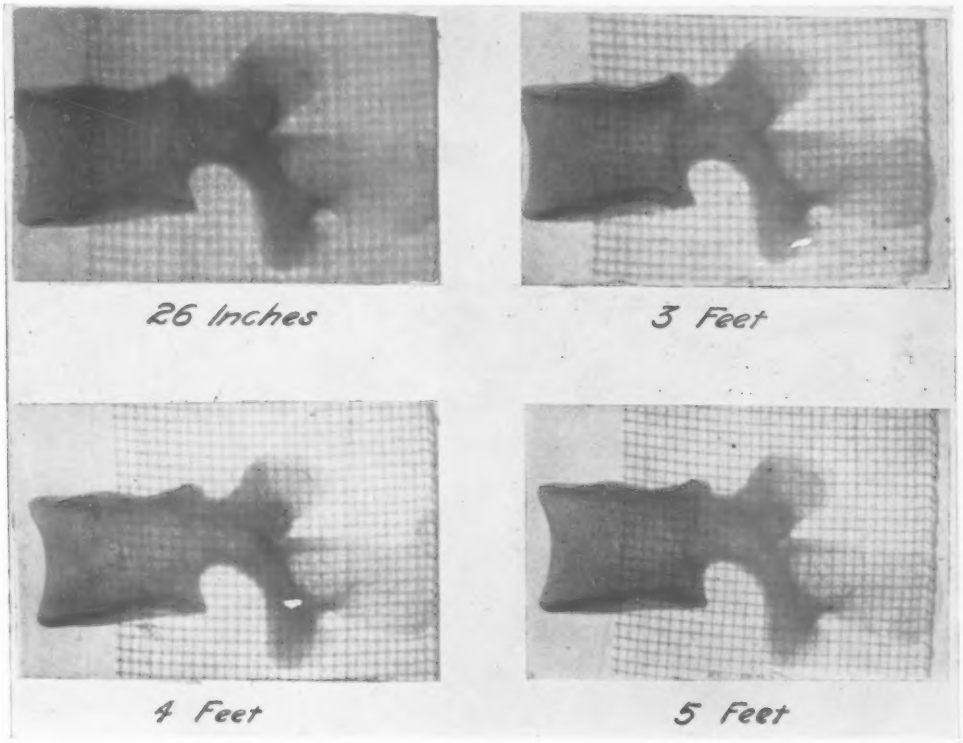


FIG. II. VARIATION OF DEFINITION WITH TUBE DISTANCE OBTAINED WITH THE BROAD FOCUS TUBE.

EXPERIMENT NO. 3

Object.—To determine the tube distances at which the same definition is obtained with the four types of tubes using the same parallel gap and exposure time and the maximum rated milliamperage in each case.

The Snook transformer was operated with a 5-inch parallel gap, and the radiator, fine focus, medium focus, and broad focus tubes received 10, 20, 40, and 80 milliamperes, respectively. Only the tube distance was varied and the exposure was three and one-half seconds in each case. Fig. III shows the results obtained. With the radiator, fine focus, medium focus, and broad focus tubes at distances of 26 inches, 3 feet, 4 feet and 5 feet, respectively, the definition was practically the same. This experiment was repeated with the test block 3 inches above the plate with the same results. The radiator tube produced less effect on the plate in three and one-half seconds than the larger tubes, but roughly speaking the photographic effect was the same for all of the four tubes. This experiment indicates that if the tube distances

are so adjusted that equally good plates are obtained with each of the four types of tubes one type is very little faster than another. It also shows that there is a definite relation between the size of the focal spot and the minimum tube distance at which the best definition is obtainable. The curve shown in Fig. IIIa was plotted from the data obtained in this experiment and shows that there is a direct proportion between size of focal spot and the minimum tube distance giving good definition. Dr. W. D. Coolidge was kind enough to furnish the data covering the sizes of the focal spots and to explain that the relation shown by this curve is a true one. The small tube operated at 26 inches produces considerable distortion, but this is not often an objectionable feature. It has been claimed that where it is necessary to make rapid exposures, as in the case of a crying child, the 10 milliampere radiator tube would be too slow to be of any value. The following experiment throws some light on this point.

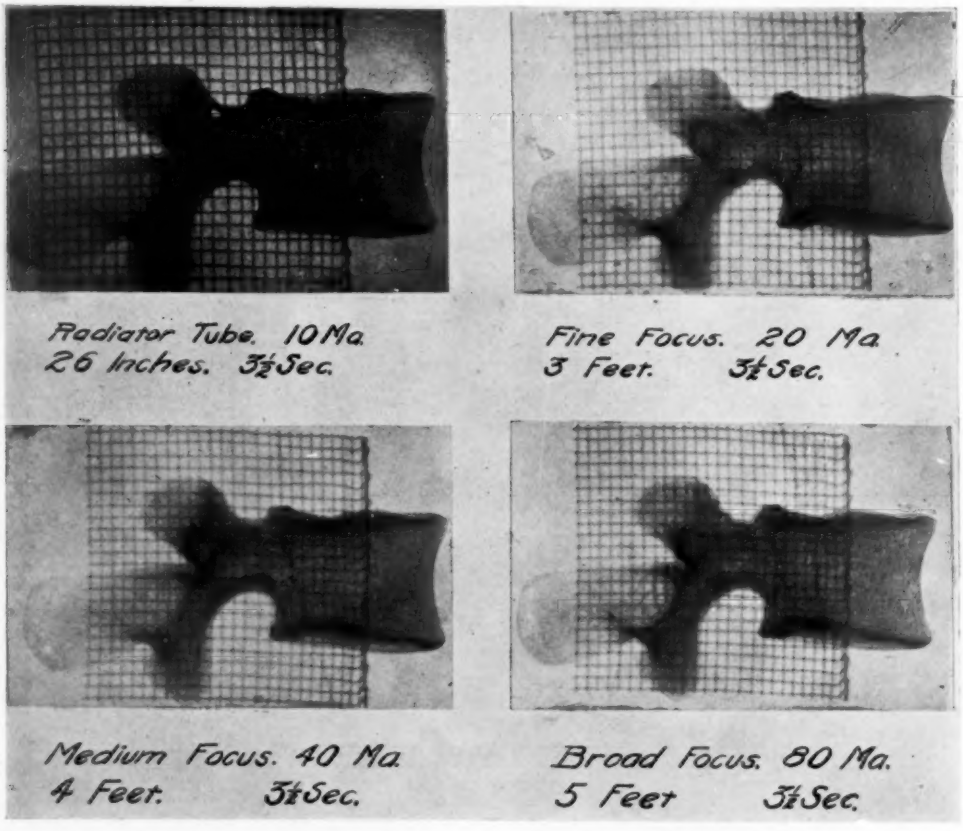

Radiator Tube. 10 Ma.
26 Inches. 3½ Sec.
Fine Focus. 20 Ma.
3 Feet. 3½ Sec.
Medium Focus. 40 Ma.
4 Feet. 3½ Sec.
Broad Focus. 80 Ma.
5 Feet 3½ Sec.

FIG. III. RADIOGRAMS MADE WITH THE FOUR TYPES OF TUBES WITH TUBE DISTANCES ADJUSTED SO AS TO GIVE APPROXIMATELY THE SAME DEFINITION IN EACH CASE.

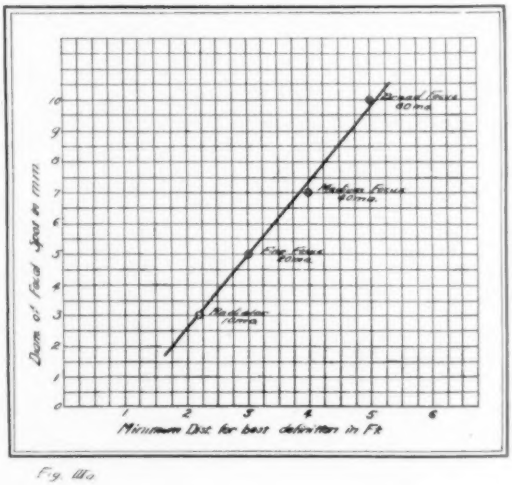

Broad Focus 80 ma.
Medium Focus 40 ma.
Fine Focus 20 ma.
Radiator 10 ma.
Diam. of Focal Spot in mm.
Minimum Dist. for best definition in Ft.

Fig. IIIa

EXPERIMENT NO. 4

Object.—To compare the exposure time required and the definition obtained with the small tube carrying 10 milliamperes used in conjunction with an intensifying screen and the broad focus tube carrying 80 milliamperes used without a screen, both tubes being operated at a 26 inch tube distance with the same parallel gap.

Fig. IV shows the results obtained. The radiograms made with the small tube and screen require less exposure for the same photographic effect and show decidedly better definition than those made with the broad focus tube at the same distance.

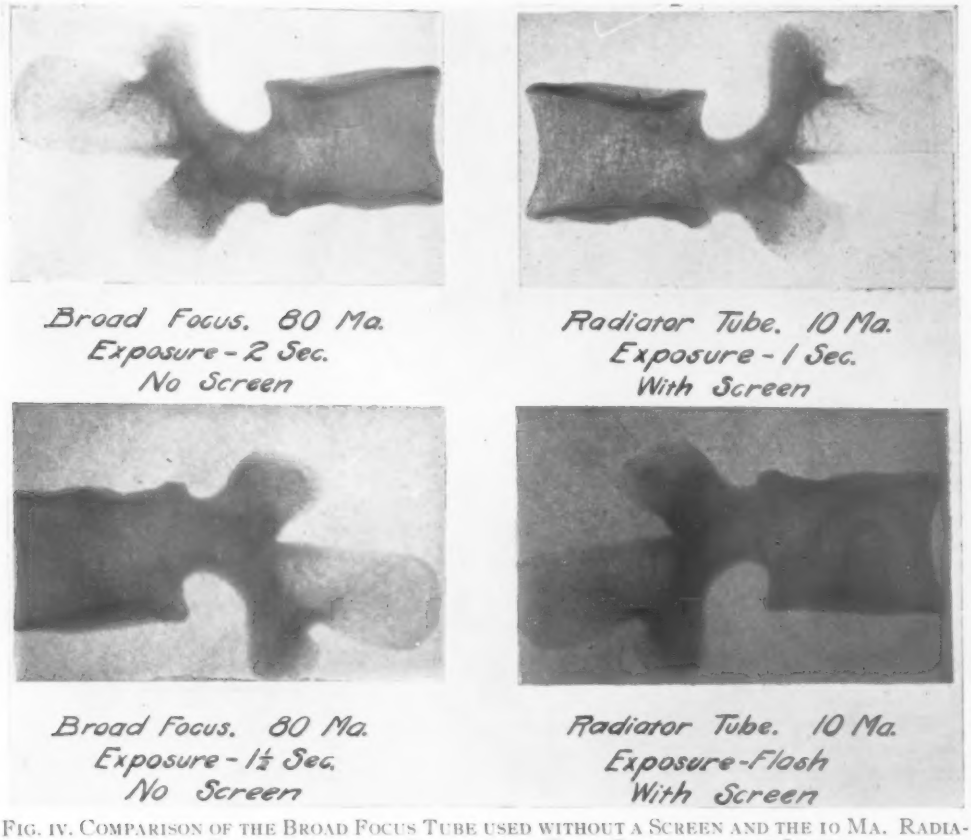


FIG. IV. COMPARISON OF THE BROAD FOCUS TUBE USED WITHOUT A SCREEN AND THE 10 MA. RADIATOR TUBE USED WITH A SCREEN AT A TUBE DISTANCE OF 26 INCHES.

SUMMARY

I. Variation of size of focal spot does not cause any variation in photographic effect so long as all the other conditions are constant.

II. When a given standard definition is to be obtained the exposure time is always approximately the same regardless of the size of the focal spot if the tubes are operated at their maximum rated milliamperage and the tube distances are properly adjusted.

III. The minimum distance at which the best definition is obtainable is directly proportional to the size of the focal spot.

IV. The 10 milliampere radiator type of tube used in conjunction with a screen at a 26 inch tube distance gives better definition in less time than a broad focus tube carrying 80 milliamperes placed at the same tube distance and used without a screen.

It would seem that where screens are available and the best possible definition is to be obtained, one type of tube has little advantage over another. The small 10 milliampere radiator tube seems to compare favorably with the older types designed for higher milliamperages.

SIGNIFICANCE OF ANNULAR SHADOWS*

BY WILLIAM A. EVANS, M.D.

DETROIT, MICH.

PREVIOUS to last year, it had been our custom to interpret all annular shadows on chest plates as cavities. In reporting several thousand cases during the preceding years, we had never questioned that an area of decreased density surrounded by an area of increased density should be considered other than a cavity. Of course, we had recognized pneumothoraces of the larger type, which were at times clinically and roentgenologically confused with cavity formation. We believe that the same interpretation of these shadows was made by other laboratories, because a complete review of the subject and a study of a large number of reproductions of chest plates did not reveal where any reference was made to a localized pneumothorax.

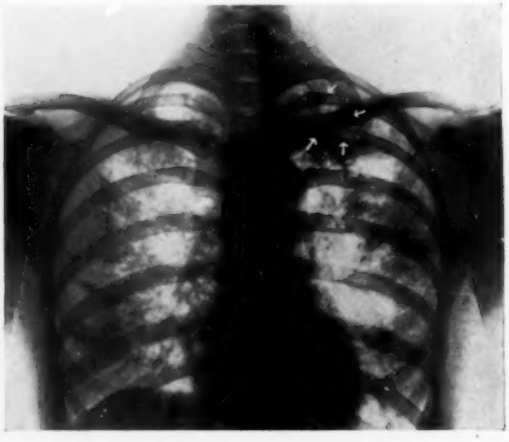


FIG. 1. LOCALIZED PNEUMOTHORAX OPPOSITE THE CLAVICLE IN THE UPPER LEFT. NOTE DIFFUSE BILATERAL PARENCHYMAL TUBERCULOSIS.

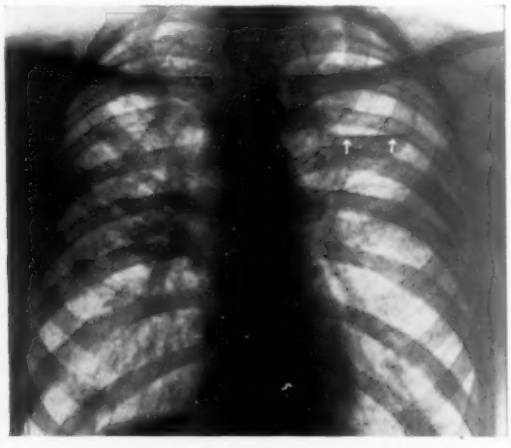


FIG. 2. LARGE AIR POCKET IN THE UPPER LEFT LUNG FIELD. NOTE STRAIGHT LINE WHICH IS DEFINITELY INDICATIVE OF FLUID. INDISTINCT OUTLINES OF AIR POCKETS IN THE UPPER RIGHT.

A review of roentgenograms recently published by Dunham in the Stereo-clinic failed to show that this question had been discussed, and in fact several cases described as showing cavity formation were in reality cases of localized air pockets. In making a report on a chest examination, last fall, we noted an annular shadow which we described as atypical of a cavity, but no suggestion was made that it might be a localized pneumothorax. There was a small amount of fluid present in the circumscribed area, this supporting the view that the condition was one of cavity formation. Plates made several weeks later of the same case showed a marked diminution in the size of the supposed cavity and showed the absence of fluid. This of necessity suggested that our first interpretation was an error.

A search of literature at this time brought to view an article published by Morris Fishburg, entitled "Localized Interlobar Pneumothorax Complicated with Pulmonary Tuberculosis," *Archives of Internal Medicine*, November, 1917, which covered quite fully the differential diagnosis between cavity formation and localized pneumothorax. About this time, we heard of Heise's and Sampson's work at the Trudeau Sanitarium, and during a visit at this institution we had the opportunity of seeing many plates showing annular cavities

*Read at the Nineteenth Annual Meeting of THE AMERICAN ROENTGEN RAY SOCIETY, Chattanooga, Tenn., September, 1918.

which were correctly diagnosed as localized pneumothoraces. The Heise and Sampson article did not appear in print until four months following the presentation of this paper, but the author wishes to acknowledge the aid he received in a study of the subject under consideration during his visit to their laboratory.

The importance of this subject can hardly be overestimated, because there is a vast difference in the prognosis of a case showing a localized destruction of lung tissue and one showing localized collection of air between the pleuræ. Our inability or failure properly to interpret shadows resulting from a localized pneumothorax is undoubtedly the explanation of many of the differences in the roentgenological and physical diagnoses of chest conditions.

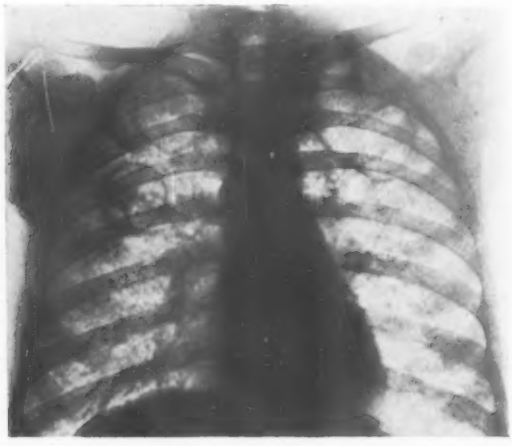


FIG. 3. TWO LARGE AIR POCKETS IN THE UPPER RIGHT LUNG; ONE IN UPPER LEFT. THE LOWER SHADOW ON THE RIGHT SIDE IS INTERLOBAR.

FIG. 4. LOCALIZED AIR POCKET IN THE UPPER LEFT NOTE A LATERAL PNEUMOTHORAX WHICH WAS DONE FOR THERAPEUTIC PURPOSES. THE LUNG DID NOT COLLAPSE AT THE SITE OF THE CIRCUMSCRIBED SHADOW OWING TO THE PLEURITIS.

Localized air pockets are observed in both the peribronchial and parenchymal types of tuberculosis, the greater number being seen in peribronchial infection. The development of collections of air depends, first, upon a superficial involvement of lung tissue, the pathology either being interlobar or occurring in the parietal portions of the lung tissue. First, there is a pleuritis with or without fluid, and then an ulceration or rupture of the lung tissue, so that air escapes into the area of pleuritis. It was interesting to observe that one could prophesy from certain roentgen plates where a localized pneumothorax would be likely to develop owing to the superficiality of the lesion.

In making a differential diagnosis between cavity and localized pneumothorax, there are several aids. In the first place, the outline of the localized area of decreased density is irregular both as to contour and density, and it shades off gradually into the surrounding lung tissue, and practically all of the normal lung structure is observed throughout the area. One can also be guided in the correct interpretation of shadows by the pathology presented in other portions of the chest; for instance it would be quite unusual for a fibroid type of miliary tuberculosis to present a cavity, and it would be equally rare to find a cavity with the very common type of peribronchial tuberculosis. However, the most reliable method of differentiation between the two conditions is the obtaining of serial plates. While the changes in cavity formation from week to week is relatively nil, the changes in the localized pneumothoraces are quite marked even from week to week.

Fishburg in his article seemed quite con-

fident that he could differentiate between the two conditions by the physical method of examination, but unquestionably a small sized localized air pocket gives no physical signs whatever, and this would be especially true in collections of air which form deep between the lobes of the lung.

The location of annular shadows will not serve as an aid in differential diagnoses, because the two lesions form with equal frequency in the same part of the chest; that is, the cavity forms more frequently in the upper lobes and pneumothoraces occur in the same location, but more especially between the lobes.

The clinical importance of air pockets is that they are evidence or a manifestation of a progressive tuberculosis; for it is evident that the lesion cannot develop unless there is ulceration or rupture of the lung tissue.

CALCIFICATION IN ANGIOMATA

BY HOWARD E. RUGGLES, M.D.

SAN FRANCISCO, CALIF.

THERE is a form of calcification appearing in hemangioma which apparently is not well recognized either pathologically or roentgenologically.

It appears in the form of multiple, small, cyst-like masses varying in diameter from a millimeter to a centimeter, or more, with a thin shell and an irregular mass in the center giving a plate which suggests encysted parasites. These spots are scattered through the growth, and probably represent calcification of thrombi in loops of the cavernous type of hemangioma.

The first case was observed in 1915 and reported in the *American Atlas of Stereoroentgenology* of December, 1916. One of the calcified nodules was removed, but the type of growth was not recognized at

FIG. 1. CASE I.

FIG. 2. CASE II.

FIG. 3. CASE III.

FIG. 4. CASE IV.

operation. Examination of the specimen showed only a structureless mass of calcified material.

In the second case the site of this appearance was obvious, as it occurred in a large angioma below the left jaw. The clinical note reads: "Large angioma extending from behind the angle of the left jaw to the midline in front and downward into the neck for five centimeters." There was

FIG. 5. CASE V.

no operation in this case and the patient was lost track of.

Case III showed an angioma involving the palmar surface of the thumb, the thenar eminence, and extending upward above the wrist for several centimeters. The patient was treated with radium for

one and one-half years with slight diminution in the size of the growth. This case is of interest as it shows considerable deformity in the ulna and phalanges of the thumb as a result of pressure from the tumor growth.

Case IV showed an angioma over the right iliac crest running transversely, and another at the level of the tenth rib behind, extending from ten centimeters outside the midline to the axilla.

Case V was observed in the course of a routine examination of the left elbow, in search for the cause of slight indefinite pain in that region. There was no objective evidence of the tumor in this case.

In none of the cases was there evidence of similar masses elsewhere in the body. Aside from the deformity present in the cases with obvious tumor masses, the signs and symptoms were slight or negligible. The condition is apparently benign.

It is of interest to note that this type of growth also occurs in the liver and intestine, so that it is possible that similar shadows may be observed in those regions.

EXACT LOCALIZATION OF FOREIGN BODY OF SOME LENGTH BY THE FLUOROSCOPE

BY J. KAUFMAN, M.D.

BROOKLYN, N. Y.

IN extracting a foreign body of any length from the tissues by electro magnetic influence, it is of considerable importance for the surgeon to know its length, its obliquity, the point of emergence of its long axis from the skin, and the distance the proximal end is from this emergent point along its axis.

Even if magnetic extraction were not to to be used, these points would be of considerable value to the surgeon.

In Diagram 1, the points in question are:

1. A–B, the length of foreign body.

2. < CAB, the angle the body makes with a horizontal plane (its obliquity).

3. S, the point at which the axis emerges from the skin.

4. A–S, The distance the proximal end, A, lies below S along the axis of A–B.

If these points were known, a magnet could be set at S, and the pull directed along A–B as an axis. Extraction with this setting would occasion a minimum of tissue trauma, and the extraction would be done with the maximum of efficiency.

If "nail extraction" were used, then a nail could be driven at S, at the obliquity of the body (< CAB), and for a distance equal to A–S. The end of the nail would then touch the body A–B at A, and it and the body would be in the same straight line. A magnetic pull could then be applied through the nail and extraction would be a comparatively simple matter.

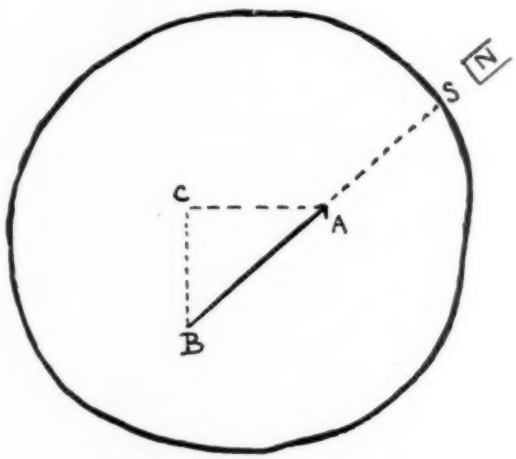


Diagram I

Let us first determine the length of the body (A–B), and its obliquity (< CAB). To comprehend readily the method of determination, it is necessary to refer to Diagram II.

S_a is first centered over the center of the screen.

S_b is then thrown on the screen, and the distance S_a–S_b is measured.

The distances S_a–A and S_b–B are determined. The Strohl (fixed angle) or any other method which gives direct distances accurately, may be used. At the same time 2–B and 1–A are determined.

The right angled triangle A′B′C′ (Diagram III) is constructed with A′–C′ equal to S_a–S_b (Diagram II) and C′–B′ equal to S_b–B minus S_a–A.

Triangles A′B′C′ and ABC are easily proved equal.

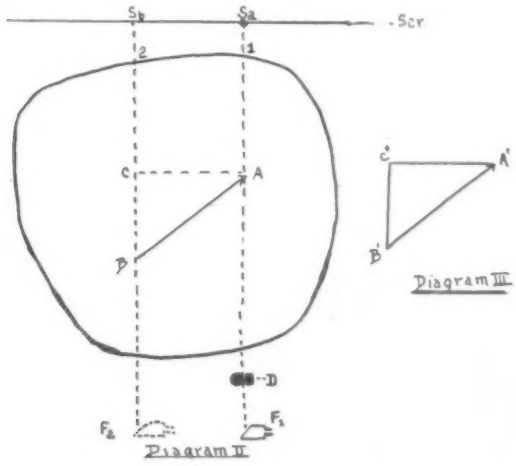


Diagram II Diagram III

KEY

Scr.	Screen.	S_a	Vertical shadow of A. (On center of screen, target at F_1.)
A–B	Foreign body.	S_b	Vertical shadow of B, (target at F_2).
F_1	First position of target.	S_a–A	Distance of A below screen.
F_2	Second position of target.	S_b–B	Distance of B below screen.
D	Diaphragm.	1—2	Skin markings.

A′–B′ represents the length of the body.

Angle < C′A′B′ represents the angle it makes with the horizontal plane.

We have now determined the length and obliquity of A–B. Let us now determine S, the emergent point of its axis from the skin.

In Diagram IV, 1 and 2 represent the vertical projections of A and B. The horizontal projections, 3 and 4, can easily be marked on the skin, knowing distances 2–B, and 1–A. (The parallax can be used conveniently. Arm O–P is set at the level of 2. Arm M–N is set so that "H," the distance between the arms, is equal to 2–B. 3 is then marked by pushing arm M–N against the skin. Point 4 can be marked in the same way.)

Points 3 and 4 need not be horizontal skin points, but may be vertical points of the ends of the body if the position of the parts is changed.

Having determined points 3 and 4, connect them and prolong this line.

Connect points 1 and 2, and prolong

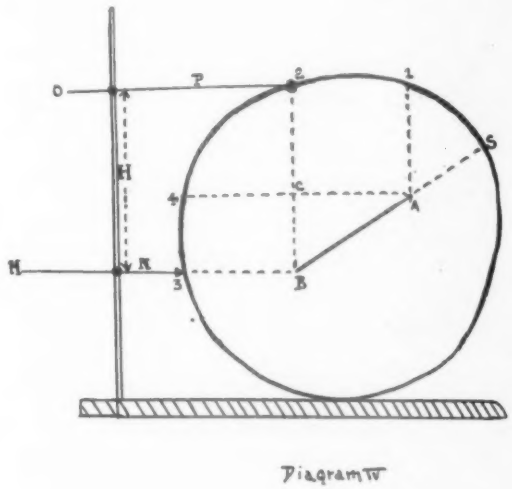


Diagram IV

this line. The intersection of these two lines represents S. That this is so, requires but little thought. Two planes passed, one through A, B, 1 and 2, the other through A, B, 3 and 4, intersect along A–B.

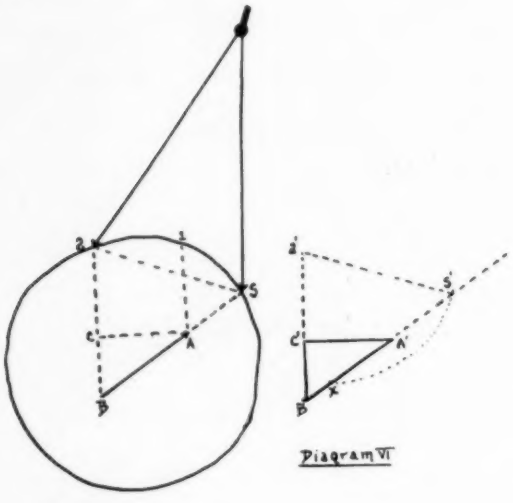
Any two lines in these planes must intersect along A–B. (Two lines in any two intersecting planes can only intersect at the intersection of these planes.) Lines 1–2 and 3–4 lie in planes whose intersection is A–B, and their intersection, S, must, therefore, lie along this same axis.

S, therefore, represents the emergence of AB from the skin.

Now to determine distance S–A (the distance A lies below the emergent point of the axis, along this axis): This can easily

be done as follows: We make use of our original triangle A′ B′ C′ (see Diagram VI).

B′–2′ is made equal to B–2 (Diagram V).



Distance 2–S (Diagram V) is gotten by means of a compass.

With 2′ (Diagram VI) as a center, and 2–S as a radius, an arc is swung. It intersects B′–A′ at S′ (and also at X).

Triangles 2SB and 2′S′B′ are equal.

B′–S′ is equal to B–S.

A′–B′ is equal to A–B. (Proven in the original construction.)

A′–S′, therefore, is equal to A–S (the distance the proximal end A is from the projection).

[The point X should not be confusing. To check up which is the proper triangle, it is only necessary to place 2′–S′ parallel to 2–S, when 2′–B′ will be found to be vertical, as it should be. If 2′–X were placed parallel to 2–S, 2′–B′ would not be vertical. One can easily tell by the topography of the part which is the correct triangle without the above check.]

We have now determined each and every point required for an accurate localization of a body of some length, and we have done this solely by means of the fluoroscope. The body is now ready for removal by electromagnetic extraction, by dissection, or by a combination of both.

The writer is indebted to Captain E. S. Blaine, M.C., for his valuable assistance and cooperation.

DISCUSSION OF DR. W. H. B. AIKINS' PAPER

THE VALUE OF RADIUM IN CURING DISEASE, IN PROLONGING LIFE, AND IN ALLEVIATING DISTRESSING SYMPTOMS*

Dr. W. S. Newcomet, Philadelphia.—The first point I wish to touch upon is the word "cure." It has always been a sore point with me, as with Dr. Aikins. The word "cure" is hard to define, and it is still harder to decide when it can be properly used. Dr. Aikins has called attention to the fact that many of these patients have remained well for ten to fifteen years, but it must be remembered that many cases take from twenty to thirty years to run their natural course, and this is also true in cancer of the female breast. But that we get results in these cases there is not the least doubt, and if patients are clinically cured and have the sense of well being, that is sufficient. Some institutions have disallowed the word in their reports, but that is a matter of caution. In my opinion if they are clinically cured, that is sufficient, and warrants the use of the word.

Another point that is usually confused is the difference between emanation and the different rays. It should be remembered that the emanation is an element, just the same as copper and iron. The alpha, beta and gamma rays, if they be so regarded, come off during the change of these various elements. However, as to any selective action existing, the results obtained from the application of radium element, emanation, or the *x*-rays, are not so much due to the form of radiation used as to

*Published in the September, 1919, issue of The American Journal of Roentgenology.

the technic employed in its application. This is particularly well emphasized in the employment of radium in the treatment of uterine cancer, and of angiomata, both which troubles were treated some years ago without result.

You may think that the treatment of angiomata could not be regarded under the caption of life-saving; but if you had seen some infants that have been relieved of masses almost half the size of the infant's head located over the great vessels of the neck, all doubt would be removed.

In regard to the leukemias, I agree with Dr. Aikins again. I believe the results are better following radium than *x*-ray application. Quite a number of cases, perhaps somewhere around forty, were treated with both *x*-rays and radium, and I feel certain that the radium results, taken all in all, have been better than in those cases where the *x*-rays were employed.

A point (I don't know whether Dr. Aikins meant what he said or not) was on the matter of selecting and treating cases. While he spoke of it, it brought to mind a child who had a gland in the neck not long ago, which was treated by *x*-ray and promptly disappeared. The mass was easy enough to cure; but a little later this child developed trouble in the chest and it turned out to be sarcoma. There is no doubt that the tumor that was rayed in the beginning was a sarcoma and not a simple enlarged gland. For that reason, we have to be very careful in the selection of these cases. In some instances we can get better results with radiation than with operation, but unfortunately we do not know the character of the trouble until it has been removed and examined microscopically. This youngster would have had a far better chance for life had the proper course been pursued.

Not only is radium a life saver, but in those unfortunate cases that come to us for treatment where everything has been done, we can by its use do something to relieve their trouble and give them hope that there is a chance of being cured.

Dr. W. L. Clark, Philadelphia.—The longer I employ radium and see it used widely from the side lines, the more I am impressed with its great value. I believe, however, that men who have used radium should also be prepared to use other like methods, not only in the treatment of cancer but in other conditions, such as Dr. Aikins mentioned—the combination of roentgen rays, the electrothermic and the other methods. There are times when the violet rays do better than the *x*-rays, and times when the *x*-rays are better than the other. I have had an unusual experience in nevus vascularis. The results with radium were perfectly ideal, the scars are immaterial. We also get good results with the electrothermic methods. There is one type that has been very difficult to treat, and that is the very large cavernous type covered with perfect skin, with perhaps just a small rather elevated area of discoloration. A recent experience made me think some advance had been made. The best cases with radium require a long time. This case was passed upon by a radium man who thought that a good result might be obtained in the case, but not for a period of years. The people could not wait. We decided to use the coagulation method. A large angioma of the cheek, the size of a large orange, occupied the side of the face. We assured them that our needle would leave the skin unimpaired, the blood lake was coagulated and the lump came away in sections. The cheek had only a small scar left in the center and resumed its normal contour just like the other side.

Dr. Henry Schmitz, Chicago.—We have treated several cases of splenomyelogenous leukemia with radium. We noticed that we would very soon obtain a reduction in the size of the spleen, a decrease in the number of white blood corpuscles and a corresponding increase in the red blood corpuscles. Within four to six weeks the patient's blood picture was practically normal and the spleen markedly reduced in size. As soon as the latent action of the rays ceased, the spleen again grew larger and the typical blood picture returned. We then decided to remove the spleen. One case, a girl of fourteen, who had an enormous spleen, had a very speedy reduction in the size of the spleen from the action of the radium. But within six weeks the spleen again enlarged and the white corpuscles increased. We again subjected her to treatment and then removed the spleen. I did not see the patient for a while and was called one day and told that the patient was bleeding from the nose. The girl had a recurrence, and we then began to treat her over the region of the spleen in spite of the splenectomy. I do not think that splenectomy im-

proves a patient's chance for recovery, but it certainly renders them free from symptoms for a year or two. Furthermore, removal of the enormous sized spleen is surely a benefit to the patient.

Dr. D. T. Quigley, Omaha.—I came in late but I wish to say one thing which I think has a very important bearing on the splenomyelogenous leukemia. None of them have recovered; they have had recurrences and have died. I think the men who use *x*-rays get nearly as good results as those who use radium. I have one patient who has gone nearly three years without recurrence and the difference between that patient and the others is this: the patient who has gone for three years and has no sign of recurrence was treated by a country doctor who had read Barker's paper on the etiology of splenomyelogenous leukemia, in which he advanced the idea that these things were probably due to mouth infection. This country doctor treated the case, and the first thing he did was to have every tooth removed. The patient recovered and is well, and is the only patient I know who has gone over two years without recurrence.

Dr. H. K. Pancoast, Philadelphia.—I would recommend that extreme caution be observed in extracting teeth in leukemia patients, as it is frequently a dangerous procedure. We always warn dentists to be exceedingly careful in removing teeth in such patients, for there is very likely to be a severe hemorrhage.

The remarks of Dr. Schmitz relative to treating the area of the spleen after its removal seems like trying to get something for nothing. I do not see why the bone marrow of all the bones of the body should not be exposed. It undoubtedly produces a decided effect upon the leukemia; not so rapid perhaps as the treatment of the spleen, but a very definite effect, and we have always felt in the years since we first advocated doing it that our patients were somewhat better for having radiation of all the bones of the body. I do not see, however, how they can be helped by treating the area of the spleen after its removal. It may have some influence on the blood cells.

(Dr. Schmitz stated that in the case of the little girl all of the bones were treated.)

Dr. Leda J. Stacy, Rochester, Minn.—I know nothing of the radiation of the splenic area after removal of the spleen. Our idea in treating the splenic area is for the reaction on the blood, because after removing the spleen there has not been found the increased connective tissue following a heavy dose of radium and reduction in the size of the spleen.

Dr. Douglas Quick, New York.—Treating the long bones with *x*-rays in connection with radium over the spleen has been our plan at the Memorial Hospital, and we think that this has a greater degree of permanence than treating over the spleen alone. I remember one case in which treatment over the spleen produced such intense nausea that we had to use the treatment over the long bones entirely and not over the spleen at all; but we got good results. The patient remained well for nearly three years. The spleen was reduced in size just as in other cases.

In regard to the question of the blood stream, I don't know whether it is safe for me to mention at this time some work that we have been doing. It is the injection of the active deposit of radium intravenously, and we have had some very spectacular results so far. The time has been too short to draw any definite conclusions; but in some of these cases we have had some very marked changes in the blood pictures and reduction in the mass. One patient of Dr. Janeway's, a case of lymphatic leukemia with generalized enlargement of the glands, had a very prompt reduction of the glands, so that they were not palpable; but that was only four or five months ago. Another case was a lymphosarcoma with an abdominal mass and inguinal, axillary, and cervical nodes, one of which was removed for section and found to be a lymphosarcoma. In that case with radium over the mass and injection of the radium we had splendid results. Those are just two instances of a number of cases we had tried this method on in the last few months. It is something new and we do not know where we are just yet, but the results obtained are encouraging and interesting.

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TWENTIETH ANNUAL MEETING OF THE AMERICAN ROENTGEN RAY SOCIETY

The Twentieth Annual Meeting of THE AMERICAN ROENTGEN RAY SOCIETY was held September 3–6, 1919, at the Grand Union Hotel, Saratoga Springs, New York. It seemed to be the consensus of opinion of those who attended that this was the most interesting of any of the meetings of the Society. In point of attendance, the registration showed a larger number of members present than ever before. The Program Committee and the Local Committee of Arrangements are certainly to be congratulated on having secured the presentation of so many papers of distinct educational value and on having made such complete arrangements for the comfort of those in attendance. A large number of guests were registered, and the large hall at which the sessions were held was well filled from the first paper until the last.

Many features combined to contribute to the general success, namely, the perfect weather which prevailed and the fact that the accommodations were so commodious that there was no crowding. Future committees would do well to bear this point in mind, inasmuch as a large meeting hall contributes indirectly to the comfort and success of the meeting.

Among the agreeable features presented were the side trips, which were carefully planned and solendidly carried out. The first trip was a visit to the Research Laboratory of the General Electric Company at Schenectady, New York. Members and guests left at noon by special trolley cars, and on their arrival at Schenectady were given a buffet lunch, after which the afternoon was spent in the Research Laboratory. The most admirable arrangements were made for the demonstration of the features of the laboratory and of the manufacture of *x*-ray tubes. Small parties of about twenty were made up, each with a guide, so that adequate explanations were given *en route*. Furthermore, each visitor was provided with a typewritten description of the features of each department. In this way everyone was able to realize every detail that was being exhibited.

A second trip was made to the Metropolitan Life Insurance Company Sanatorium, at Mount McGregor, New York.

The guests had the opportunity of seeing the beautiful buildings of the Company and to enjoy the magnificent views presented from different points of the ascent of the mountain and also from the various viewpoints about the Sanatorium. A very interesting feature was the visit to the Grant Cottage, where are still preserved many of the relics and souvenirs of the last days of President Grant. Dr. Howk, the Director, presented many interesting lantern slides typifying the progress of tuberculosis in some of the cases under treatment.

Friday evening, September 5th, Dr. W. T. Bovie of the Cancer Commission of Harvard University, Boston, delivered a lecture which will be long remembered by those who had the good fortune to listen. It was abundantly illustrated by lantern slides, and while the subject matter was new to many of his listeners, the lecture started out with simple statements which were gradually elaborated, and in this manner held the attention of his audience even through the more technical parts of his address.

Practically all of the papers which were listed in the program were presented and abundantly illustrated by lantern slides. The fact that the auditorium was of good size with high ceilings and was adequately darkened for the demonstration of the slides were points which contributed to maintaining the interest. Special notice must be taken of the paper presented by Dr. William H. Stewart and Dr. Arthur Stein, entitled: "Roentgen Ray Study of the Abdominal Organs Following Inflation of the Peritoneal Cavity with Oxygen." Dr. Stewart reported a series of 37 cases and illustrated the technique of the introduction of oxygen into the peritoneal cavity and the brilliant plates obtained by furnishing a gaseous background for the various solid abdominal organs. It was the opinion of many that this work marks the beginning of a distinct era in roentgen diagnosis second in importance only to the introduction of the opaque meal in gastrointestinal studies.

Members who were interested in treatment enjoyed the symposium on Goiter and its Roentgen Treatment. The symposiums on the Heart, with papers by Drs. Lewald, Van Zwaluwenburg and Holmes, were of great interest. The papers which took up the roentgen ray work in the Canadian and American Armies by Colonel Wilson and Colonel Johnston respectively, were also much appreciated. The symposium on Bone Disease, participated in by Drs. Murphy, Evans, Bowman, Moore, and Cotton, was very instructive. Dr. George C. Johnston demonstrated a new device for preventing accidents from high tension current during radiographic and radiotherapeutic exposures which excited much comment. Another interesting demonstration was made by Dr. Heck of a simple type of Stereoscopic Fluoroscope.

Particularly interesting from a technical standpoint was the presentation by Dr. W. D. Coolidge of Schenectady, N. Y., of a new piece of apparatus in which the *x*-ray tube of small dimensions is mounted inside the transformer box so that the tube and transformer form a single enclosed unit. The principles shown in this new type of apparatus, which is still in the process of development, would seem to forecast a revolution in future types of fluoroscope tables and radiographic tube stands.

The annual dinner held on the evening of Thursday, September 4th, was well attended. Dr. Bowen acted as toastmaster. Among the speakers of the evening were Dr. A. W. Crane of Kalamazoo, Dr. P. M. Hickey of Detroit, Dr. Pirie of Montreal, Dr. James T. Case of Battle Creek, Dr. Arthur C. Christie of Washington, Dr. George C. Johnston of Pittsburgh, Colonel Wilson of Toronto. The after dinner dance was much enjoyed, especially by the ladies in attendance.

One of the important features of the business session was the establishment of an Eastern, Middle and Western section, with provision for sectional government under the auspices of the parent society. It is planned that these sections will each hold mid-winter meetings at points most

convenient for the membership. A number of new members were admitted, and the following officers were elected for the ensuing year:

President: Dr. James T. Case, Battle Creek, Michigan; First Vice President: Dr. M. P. Burnham, San Francisco, California; Second Vice President: Dr. Stanton Heck, Salem, Ohio. Dr. G. W. Grier was reelected Secretary and Dr. W. A. Evans of Detroit was again made Treasurer. Mr. H. W. Dachtler was made Librarian and Historian for the ensuing year. Dr. Alexander B. Moore was chosen as a member of the Executive Committee. Drs. Jaches and Bowen were placed on the Publication Committee.

The publication of the papers read at the meeting will commence in the November number of THE JOURNAL.

P. M. H.

The Program of the Meeting was as follows:

PROGRAM

Wednesday Morning, in the Casino
Opening Session at 9.30

Welcome: By the Local Committee; Dr. Earl H. King, Chairman.

Response: By Dr. David R. Bowen, President.

Symposium—Technical:

A Simple Localizing Fluoroscope (Illustrated): Dr. Edwin C. Ernst, St. Louis.

A High Tension Terminal Guard (Illustrated): Dr. George C. Johnston, Pittsburgh.

A Stereoscopic Fluoroscope (Illustrated): Dr. Stanton Heck, Salem, Ohio.

Teleroentgenography of the Head (Illustrated): Dr. Preston M. Hickey, Detroit.

Physical Investigation Work in Progress on Tubes and Accessories: Dr. W. D. Coolidge, Schenectady, N. Y.

Intensifying Screen Efficiency: Millard B. Hodgson, Rochester, N. Y. (by invitation).

Wednesday Afternoon at 2.00

Symposium—Bone Diseases:

Dislocation of the innominate Bone: Dr. John T. Murphy, Toledo.

Multiple Myeloma of Bones: Dr. William A. Evans, Detroit.

Coccidioidal Granuloma (Illustrated): Dr. William B. Bowman, Los Angeles.

The Roentgen Study of Metastatic Malignancy in Bones (Illustrated): Dr. Alexander B. Moore, Rochester, Minn.

Further Observations of Myxoma of Bone, with Report of Second Case of Myxoma of the Femur (Illustrated): Dr. Albertus Cotton, and Dr. Standish McCleary, Baltimore, Md.

Thursday Morning at 9.00, *in the Casino*

The Aviator's Heart (Illustrated): Dr. L. T. Le Wald, New York.

A Plea for the Use of the Fluoroscope in the Examination of the Heart and Great Vessels (Illustrated): Dr. James G. Van Zwaluwenburg, Ann Arbor, Mich.

The Roentgen Findings in Pericarditis: Dr. George W. Holmes, Boston, Mass.

Discussion of papers of Drs. Le Wald, Van Zwaluwenburg and Holmes.

The Development of Radiography in the Canadian Army Medical Corps during the Great War: Dr. Robert Wilson, Colonel C.A.M.C., Toronto.

Roentgen Ray Work in the United States Army: Dr. George C. Johnston, Colonel M.C., U.S.A., Pittsburgh, Pa.

Discussion of papers of Col. Wilson and Col. Johnston.

Thursday Afternoon

Thursday afternoon was spent in the Research Laboratory of the General Electric Company at Schenectady, N. Y.

Thursday Evening at 8.00

Annual Dinner, Main Dining Room, Grand Union Hotel: Members, Ladies, Visitors.

Friday Morning at 9.00, in the Casino

Symposium—Therapy and Physiological Action:

A Report of Two Cases of Xeroderma Pigmentosum with Malignancy of the Eyeball Successfully Treated by the Roentgen Ray: Dr. George W. Grier, Pittsburgh, Pa.

Treatment of Goiter by Radiotherapy: Dr. Russell H. Boggs, Pittsburgh, Pa.

A Consideration of the Treatment of Diseases of the Thyroid with Special Reference to the so-called Hyperthyroidisms: Dr. John A. Lichty, Pittsburgh, Pa. (By invitation.)

Some Physiological Effects Produced by Radiating Definite Regions within a Single Cell: Dr. W. T. Bovie, of The Cancer Commission of Harvard University, Boston, Mass. (By invitation.)

Friday Afternoon at 2.30

At the Auditorium of The Metropolitan Life Insurance Company Sanatorium, Mt. McGregor, N. Y.

Symposium—Lung and Thorax Conditions.

Sanitorium Management of Tuberculous Patients with Special Reference to the Demonstration of Progressive and Receding Tuberculosis as Shown by Roentgen Ray Studies: Dr. Horace J. Howk, Metropolitan Life Insurance Company Sanatorium, Mt. McGregor, N. Y. (By invitation.)

Analysis of 1300 Cases Referred for Gastrointestinal Study, with Special Reference to the Importance of Chest Examination of Such Cases: Dr. Thomas A. Groover and Dr. Arthur C. Christie, Washington, D. C.

Encapsulated Effusion in Chest (Illustrated): Dr. Leopold Jaches, and Dr. Harry Wessler, New York.

The Influenza Epidemic, a Clinical, Pathological, and Serial X-Ray Study (Illustrated): Dr. John Hunter Selby, Major, M.C., U.S.A., Washington, and Dr. Joseph Harkavy, New York.

Malignant Disease of the Lung, Its Early Recognition and Progressive Development (Illustrated): Dr. George E. Pfahler, Philadelphia, Pa.

Late Results of War Injuries of the Chest: Dr. Henry J. Walton, Baltimore, Md.

Friday Evening at 8.30, in the Casino

Lantern Slide Demonstration.

Saturday Morning at 9.00, in the Casino

Roentgen Ray Studies of the Seminal Vesicles and Vasa Deferentia after Urethroscopic Injection of the Ejaculatory Ducts with Thorium: Dr. Charles A. Waters, Baltimore, Md.

The Technic of Radio-surgery with Special Reference to Adaptation to Civil Life: Dr. James T. Case, Battle Creek, Mich.

Anatomic Roentgen Ray Diagnostic Lines (Illustrated): Dr. Edward H. Skinner, Kansas City, Mo.

The Early Roentgen Ray Diagnosis of Ulcerative Tuberculous Colitis (Illustrated): Dr. Lawrason Brown, Trudeau, N. Y. (By invitation.)

Roentgen Ray Study of the Abdominal Organs Following Inflation of the Peritoneal Cavity with Oxygen: Dr. William H. Stewart, and Dr. Arthur Stein, New York.

At this session the following papers will be read by title.

The Open Method of Surgery in Deep Seated Recurrent Cancer, Preparatory to Roentgen Ray and Radium Therapy: Dr. Emil G. Beck, Chicago, Ill. *Technic for this Type of Treatment:* Dr. Paul Eisen, Chicago, Ill. *Patent Ductus Arteriosus (Botalli):* Dr. Maximilian J. Hubeny, Chicago, Ill. *Some Observations on the Roentgenographic Findings in a Series of Chests Examined in a Base Hospital in France:* Dr. Francis F. Borzell, Philadelphia, Pa.

NOTICE

A number of unidentified slides were found after the Meeting in various rooms at the Grand Union Hotel. These have been sent to the office of THE AMERICAN JOURNAL OF ROENTGENOLOGY, and the owners are requested to communicate with the publisher.

Pacific Coast Society Proceedings

The regular semi-annual meeting of the Pacific Coast Roentgen Ray Society took place at the Hotel St. Catherine, Catalina Island, on May 29 and 30, 1919, and was one of the best attended meetings the Society has yet had, due largely to the return of many members from military service.

The meeting was called to order by Dr. C. M. Richards, Vice-President, in the absence of the president, Dr. H. H. Boardman.

The following papers were presented during the two days session.

"Personal Observations of a Roentgenologist in the A. E. F.," W. B. Bowman, Los Angeles; "Delayed Roentgen Reactions," Howard E. Ruggles, San Francisco; "Localization of Foreign Bodies in the Eye," W. Warner Watkins, Phoenix, Arizona; "Barium Stasis in the Common Duct," Roy A. Payne, Portland, Oregon; "A Preliminary Report on Certain Appendix Problems," H. H. Heylman, Long Beach, California; "The Roentgenologic Aspect of Bone Lesions," Lyell C. Kinney, San Diego; "A Case of Bullet in Heart Muscle and Recovery," F. C. Swearengen, Pomona, Calif.; "The Roentgenologist vs. the Radiographer," Chas. W. Stewart, Los Angeles; "Roentgen and Radium Reactions," Albert Soiland, Los Angeles; "Endothelioma of Chest; Postmortem Findings," A. C. Siefert, Oakland, Calif.

The following officers were elected for the ensuing year:

President, Dr. W. B. Bowman, Los Angeles.

Vice-President, Dr. M. P. Burnham, San Francisco.

Secretary-Treasurer, Dr. C. M. Richards, San José.

Executive Committee, Drs. Albert Soiland, L. C. Kinney, W. W. Boardman.

A most delightful feature of the meeting was the trip from San Pedro to Catalina and return as the guests of Dr. Soiland on his commodious yacht, "Viking III."

The following new members were elected: Dr. A. C. Seifert, Oakland, Calif.; Dr. R. J. Taylor, Los Angeles; Dr. R. A. Payne, Portland, Oregon; Dr. O. R. Stafford, Los Angeles; Dr. Llewellyn Jones, San Francisco; Dr. Charles W. Stewart, Los Angeles.

Chas. M. Richards,
Secretary.

Extract from Inspection of Medical Services with the American Expeditionary Forces

Roentgenology.

In all the hospitals visited we found complete equipment for *x*-ray work, under the supervision of specially trained experts. As in our base hospitals in this country, this is one of the most effective and practical features of the present expansion of the Army Medical Department. The findings of the expert roentgenologist are recorded and followed by the military surgeon and internist in the diagnosis of disease, in the localization of foreign bodies (projectiles) and injuries, and in determining the site of operation. This work is a most valuable adjunct to military medicine and surgery. The order, system and scientific arrangement of the radiological services visited was impressive. There are *x*-ray establishments in the evacuation hospitals and even in the field hospitals, as well as at the base. The *x*-ray room in the field hospital at Thiaucourt was found to be located in the subcellar, the unit being almost constantly under bombardment. The mobile *x*-ray units are a special feature of this work and the personnel of these units are frequently under fire.

TRANSLATIONS & ABSTRACTS

The following is an editorial in the June 15, 1919, number of the *Journal of the Indiana State Medical Association*. It puts the case so very aptly that the Editor wishes to present it *in toto*.

ROENTGENOLOGY A SPECIALTY

The development of roentgenology, and especially the practical uses to which the roentgen ray may be put as an aid in the diagnosis and treatment of diseased conditions, has resulted in a widespread sale of roentgen ray outfits to doctors and dentists of every description. As might be expected, the real value of roentgenology has been distorted and perverted through the ignorance and lack of experience of many men who have used their roentgen ray outfits as a means of broadening their sphere of activity but without properly appreciating the fact that roentgenology is a specialty in itself, and one that requires a long apprenticeship of study and experience before it can serve efficiently and well as an adjunct to the successful practice of medicine or dentistry. The average man who owns a roentgen ray outfit merely dabbles and makes a bad mess in the practice of what really is a highly specialized science, and while he develops a few facts in the simpler cases which aid him in his general work, in a far greater number of cases he arrives at erroneous conclusions as a direct result of his lack of technic and lack of experience in interpreting his results. In fact, to the average physician many roentgen ray plates are a camouflage through which he never penetrates.

To our notion roentgen ray work, like other highly specialized work, should be in the hands of not only those who devote the most of their time to it, but of those who have equipped themselves with the latest and best apparatus and who through training and experience are best able to apply intelligently the apparatus they possess and properly interpret the results. We realize that we are treading on the toes of a lot of men who are dabbling in roentgen ray work when we advocate specialism in roentgenology, but we feel that the sooner medical men realize and appreciate their limitations the better it will be for themselves as well as the public. Furthermore, to the man who is especially interested in roentgenology the way is open for the acquirement of skill and experience through apprenticeship under those who are recognized as specialists in the work.

There is an old saying that the man who attempts to do everything does nothing well, and it applies to the profession of medicine as well as it applies to a trade. Roentgenology is a specialty, and if we are to get the most out of roentgenology for the benefit of the profession as well as for the benefit of suffering humanity we must for the most part depend on the specialist in roentgenology for results; and this applies not only to the application of the principles of roentgenology, but to the interpretation of the results. There are many roentgen-ray plates that even a layman can interpret, but, on the other hand, there are many other roentgen-ray plates that must be interpreted by the man of wide experience and intensive training.

HOFER, G. Osteomyelitis of the Frontal Sinus. (*Monatschr. f. Ohrenkrank u. Lar-Rhinol.*, 1917, Nos. 11 and 12.)

Hofer reports an interesting case of a patient who showed a swelling the size of a thumb over the supero-internal aspect of the left orbit which was painless but depressible on pressure. The ocular globe was forced outward and downward. Vision was good and the fundus oculi normal. There was pus in both the left and right middle floor of the nose. Radiological diagnosis was osteomyelitis or new growth of the left frontal sinus. Operation exposed a large purulent cavity communicating with the left frontal sinus and in which a nonadherent sequestrum was floating which had become detached from the lower wall of the sinus. The posterior wall of the sinus was scraped in three places, while the right frontal sinus and both ethmoidal and sphenoidal sinuses were cleansed. Recovery. In a second case the patient presented a tumor the size of a hen's egg below the left eye. Operation showed that the lower and anterior walls of the frontal sinus were completely necrosed with the presence of nonadherent sequestra. There was also a sequestrum from the posterior wall of the right sinus. Death in forty-eight hours. Necropsy revealed

an acute edema of the brain, pyencephalitis and an acute meningitis of the base and convex aspect of the brain. The osteomyelitis was the result of pus retention; the inflammation of the mucosa and development of polypi on the mucous membrane prevented the flow of pus from the sinus.

WEIL, P. E., and LOISELEUR. Roentgen Exploration of Effusions in Serous Membranes. (*Presse méd.*, Paris. Dec. 3, 1917, Vol. XXV, No. 67, p. 683. Ref. *J. Am. M. Assn.*, Feb. 9, 1918.)

Weil and Loiseleur give roentgenograms showing the instructive findings when air is injected into a joint or the pleura, pericardium, vaginalis or peritoneum, after evacuation of an effusion. There are no untoward by-effects, and the air shows the distention of the parts, the laxity of the joint capsule, etc., and the presence of free bodies in a joint. In tuberculous pleurisy and pericarditis, the injection of air in the place of the effusion has a direct therapeutic action, besides rendering roentgenoscopy possible and distinct. In one case of tuberculous seropurulent and hemorrhagic pericarditis, the young patient has been clinically cured for the eight months since eight applications of paracentesis and insufflation of air in the course of seven months. When the effusion recurs, the presence of the air forces it down into the lower part where it is most readily accessible by subxiphoid puncture. They inject as much air as the amount of effusion withdrawn.

BENSAUDE, R., and GUENAUX, G. Roentgen Diagnosis of Cancer of the Large Intestine. (*Arch. de méd. de l'appar. digest.*, etc., Paris. May, IX, No. 4, p. 179. Concluded. Ref. *J. Am. M. Assn.*, July 14, 1917.)

The conclusions of this long analysis of thirty cases are that the roentgen rays may locate the lesion but that they are unable to specify its nature. Gaps in the shadow merely indicate circumscribed induration of the wall of the bowel; this may be due to ileocecal tuberculosis or ulcerative colitis as well as to cancer. Bensaude and Guénaux have noticed, however, that with the latter the shadow may spread out in the shape of the flame of a candle. They have never seen this except with cancer verified by operation (transverse colon). Another typical finding with cancer is when the shadow narrows to a small bridge between two broad shadows, looking as if a chunk had been gouged out on each side. The shadows cast by overlapping loops may hide a typical gap or narrowing in the shadow; this is particularly liable with the sigmoid flexure. They comment on other difficulties with radiologic exploration of the large intestine, but add that it may give valuable information in regard to the functioning of an anastomosis, warning of recurrence and demonstrating postoperative adhesions and the advisability of further intervention. In four of the thirty cases on which the article is based, the cancer was discovered in such an early stage that its eradication was possible. A shadow of the rectum, dotted with lithe spots, was obtained in a case of polyposis of the rectum.

VILLANDRE, C. Radiography of the Skull and its Interpretation. (*J. de radiol. et d'électrol.*, Paris. March–April, III, No. 8, p. 507. Ref. *J. Am. M. Assn.*, July 14, 1917.)

Villandre has been studying on prepared skulls or parts of skulls the solution of certain problems raised during interpretation of numerous radiograms of skull wounds. The brain fits exactly into the skull, and knowledge of the skeletal points throws light on the conformation of the brain and its various parts. He took radiograms of the brains with lead threads placed to outline the corpus callosum, the ventricles, etc. A composite outline picture thus obtained is placed on the radiographic plate. By this means the shadow cast by the projectile fits into the proper region of the skull.

NOGIER, T. Radiotherapy plus Operation in Treatment of Cancer. (*J. de radiol. et d'électrol.*, Paris. March-April, III, No. 8, p. 515. Ref. *J. Am. M. Assn.*, July 14, 1917.)

Nogier says he has been appalled at the histologic findings of cancer cells scattered through the adjoining tissues after apparently complete excision of cancers. Particularly in the breast, improved technic has revealed cells sown through the tissue far back of the primary tumor. They are not seen nor felt, and lie

latent till after the operation. This arouses them, and we have recurrence of the cancer. For this and other reasons he advocates broad and intensive radiotherapy before the operation, preoperative instead of postoperative roentgen or radium exposures. This he insists will prove successful beyond anything yet realized to date. Working with Regaud, he has conclusively demonstrated, he reiterates, that it is possible to give enormous doses of filtered roentgen rays, leaving the skin intact. They expose the cancer first, then the adjoining regions, and especially the lymph glands which are ordinarily invaded. The operation should be as early as possible, removing all the microscopically evident malignant tissue. The scattered cancer cells lose all power for reproduction under the exposures, and if any embolism occurs during the following operation the embolus is sterile and metastasis is not entailed. The cells in the depths having lost their power of reproduction, die off sooner or later and are absorbed. This absorption of cancer cells serves as an immunizing process. All the evidence therefore, he concludes, is overwhelmingly in favor of radiotherapy followed by excision as the logical treatment for cancer.

STACY. Radium Treatment of Menorrhagia. (*Minnesota Med.*, 1919, II, 88. Ref. *Progress Med. Sci.*, 720.)

Stacy has summarized the experiences with radium under these conditions as found in the Mayo Clinic, where this element has been used in 1915 in the treatment of the menorrhagia of the menopause, in cases which presented no gross pelvic lesion, and in those presenting a fibroid but with contra-indication to operation. Since then the types of cases treated have been increased, and now radium is considered the treatment of choice in all cases of the menorrhagia of the menopause in which the presence of carcinoma is definitely excluded, either by history or by a diagnostic curettement, and in those cases not presenting a large, soft myoma which is apt later to undergo degeneration. The radium is also used in cases of profuse menstruation of the young woman (1) when there is a small submucous fibroid, (2) when no gross pathological condition is demonstrable, and (3) in cases presenting a large myoma in which there is a definite surgical risk. However, they have not entirely replaced myomectomy with radium for the treatment of myomas in the patients between the ages of thirty and forty years. Of the 175 patients that were treated with radium from August, 1915, to December, 1917, there were 2 under twenty years of age, 34 from twenty-one to thirty years, 45 from thirty-one to forty, 91 from forty-one to fifty, and 14 were more than fifty years of age. Of this number 93 had had previous curettements, 37 had had more than one curettement, and 56 had undergone other pelvic operations. In 69 cases there were complications that were considered as relative, though not in every instance absolute contra-indications to operation. There were heart lesions in 34 cases, hypertension in 8, kidney lesion in 11, obesity in 8, and pulmonary tuberculosis in 6. Seventy-seven of the 175 cases had definitely palpable fibroids and it is interesting to note that 155 of the 175 patients were married women, and that of these only 25 had not been pregnant. The dosage of radium is gauged by the age of the patient, and by the presence or absence of a tumor. In the young person without a demonstrable tumor and when it is desirable to continue menstruation, usually one application of 50 mg. of radium element from four to six hours is used. In older persons in whom it is desirable to stop menstruation entirely, it has been found that an exposure of 50 mg. for from ten to twelve hours has brought about the desired results. In cases in which large dosage is used, menstruation is usually irregular for about two months and ceases entirely after the second or third month; following the lighter exposures, it becomes regular and normal in most instances in about two months. It is the custom in the Mayo Clinic not to repeat the treatment until an interval of three months has elapsed. If, after that time, menorrhagia continues, a second treatment is given, and with the exception of one case, the second treatment has been effective. In this instance menstruation ceased for one year, and then became profuse and the periods prolonged. It has been necessary to give second treatments in 10 instances in this series. In 8 instances a hysterectomy was done later, but only one of these 8 patients had been given a second radium treatment. Included in this series is one case of adenomyoma of the uterus, in which a microscopic diagnosis was made at the time of the exploratory incision,

but the tumor entirely disappeared after one intra-uterine and four abdominal treatments. Reports have been received from 143 of the 175 patients and in 55 (38.5 per cent) menstruation had ceased, not to return to the date of the report. In only 14 patients did menstruation cease immediately following the treatment. In 15 menstruation ceased for three months and returned, in 29 (20 per cent) the menstruation became normal; in 42 it was reported as regular but somewhat profuse and in 30 it became profuse. Ninety-two patients reported their condition as improved, and 27 as not improved.

STROHL, A. The Resistance of the Human Body to the Electric Current. (*J. de radiol. et d'électrol.*, Par. May, 1919, Vol. III, No. 5, p. 193. Ref. *J. Am. M. Assn.*, July 19, 1919, p. 207.)

Strohl remarks that most of the methods of electrodiagnosis presuppose an invariable resistance on the part of the tissues to the electric current. But this resistance is not invariable. It depends on a number of variable factors, as he explains in detail, with suggestions how to eliminate various causes of error.

AUBOURG, P. (*J. de radiol. et d'électrol.*, Par. May, 1919, Vol. III, No. 5, p. 193. Ref. *J. Am. M. Assn.*, July 19, 1919, p. 217.)

Aubourg reports the case of a radiologist who had always used most scrupulously the current means of protection in his thirteen years of roentgen work, even to a doubly protected glove for the left hand. But in 1912 chronic lesions developed on his hands. He kept at his work during the war, often making long exposures in restricted quarters. In two years he had thus aided in extraction of 4,000 foreign bodies. The chronic dermatitis was then treated once a month with carbon dioxid snow, applied for forty seconds at each sitting to one, two or three of the foci. The focus was then treated with bismuth held in place with a gauze bandage. This dressing was left undisturbed for ten or fifteen days. The eschar dropped off the fifteenth to the seventeenth day, and by the end of two months there was not even a trace of a scar. During the entire course of treatment the hands were kept well greased at night with a soothing salve. In thirteen months twenty-three lesions were thus treated and twenty-one subsided smoothly; one started to suppurate but this was at once aborted with magnesium chlorid, according to P. Delbet's technic. One other lesion returned at the end of three months as a wart on the spot that had been treated and had disappeared. This recurring lesion rapidly progressed but was treated and soon healed like the others. There was also a warty growth on the left forearm which looked so suspicious that excision was recommended for this, but it disappeared spontaneously while the other lesions were being treated. One would have to look close now to suspect that the hands were the hands of a radiologist. The carbon dioxid treatment did not interfere with his continuing his work; its efficacy is apparently established by the year and a half that has elapsed since. The case teaches further that the most painstaking care to avoid danger is not always effectual, as we cannot rely implicitly on the protecting devices at our disposal.

WEIL, E. A. Roentgen Treatment of Uterine Fibroma. (*An. de la Facultad de Med.*, Montevideo. Jan.-Feb., 1919, Vol. IV, No. 1–2, p. 21, Ref. *J. Am. M. Assn.*, July 19, 1919, p. 234.)

Weil remarks that no one thinks of holding modern surgery responsible for the mishaps before the asepsis era. But many medical men still hold aloof from roentgen treatment of uterine fibromas on account of mishaps they have heard of occurring in the early days of roentgen work. He claims that F. de Courmelles of France was the first to report (Jan. 11, 1904) the application of the roentgen rays in this field, and time has demonstrated the value of cross-fire exposures from a dozen different points more or less. Each field is about 10 cm. and the distance from the anticathode is 20 or 22 cm. at least. He filters through aluminum at least 1 cm. thick, utilizing only the shortest possible waves of the Coolidge tube. His smallest dose is 10 H units of the hardest possible rays, with a 22 or 24 cm. spark. The chromometer gage is 11 Benoist. He marks each field with a demographic pencil and exposes each field once or twice, going over them all successively on consecutive

days. Then he recommences the exposures after an interval of at least a month. The most puzzling problem is when to recommence the exposures. He usually gives four series of exposures, but after the first two he leaves an interval of at least five weeks. The course thus lasts six months, but the menopause becomes installed and the pains much improved during the second month. He cites Pfender's statistics showing that less than 2 per cent of uterine fibromas display a tendency to malignancy, while the global mortality from operative treatment of uterine fibromas is at least 5 per cent. He reiterates that roentgen therapy should now be the rule and operations the exception for all uterine fibromas, even the painful and the hemorrhagic ones, except that easily removable pedunculated myomas and those of exceptionally rapid growth should be removed without delay.

HARRIS. Radium in Diseases of the Ear. (*Tr. Am. Otol. Soc.*, Vol. XIV, Part II.)

Harris concludes, as a result of an extended investigation, that radium, up to the present time, has failed to be of any considerable benefit in the treatment of diseases of the ear. So far as chronic deafness is concerned it has proved virtually a failure. In the rare cases of intractable tinnitus and excessive vertigo, on the one hand, it can be employed with a reasonable hope of relief by its power of destroying the labyrinth. Finally, so far as malignant growths are concerned, it is of value when they are superficially seated. When deep seated there is nothing sufficiently encouraging to be said of it to warrant its use to the exclusion of operative measures when they can with propriety be adopted. The work that has already been done with it on the ear is not sufficient to condemn it *in toto*, however, and it is to be hoped that other investigators will take it up and give it further thorough and careful trial.

BRAASCH, W. F., M.D., and OLSON, F. A., M.D. Rochester, Minn. Roentgenographic Diagnosis in Renal Tuberculosis. (*Surg., Gynec. & Obst.*, Vol. XXVIII, No. 6.)

American writers have not recognized the importance of *x*-ray examination, while European workers on the contrary have used it very extensively. At the Mayo Clinic a complete *x*-ray examination is made in every case of suspected renal tuberculosis.

"The frequency with which positive data may be obtained in the roentgenogram is evidenced by the fact that in the years 1916 and 1917 131 patients were operated on for renal tuberculosis, and roentgenographic examination of the urinary tract had been made of all. Of this number positive shadows suggestive of renal tuberculosis were found in thirty patients, a percentage of twenty-two. It may be stated, therefore, that approximately one out of five patients with renal tuberculosis will have positive roentgenographic data of definite diagnostic value. Such data are of particular value in conditions as follows:

"1. When, because of the contracted condition of the bladder or impassable stricture of the ureter, the cystoscopic findings are inadequate.

"2. When the cystoscopic findings are not typical of renal tuberculosis.

"3. When the clinical findings are not suggestive of renal tuberculosis or of any involvement of the urinary tract, as may occur with a closed tuberculous pyonephrosis.

"4. In the presence of bilateral renal tuberculosis, when the typical shadows frequently render cystoscopy or further clinical examination unnecessary."

The shadows are due to deposits of calcium in T.B. areas and assume a variety of forms.

"They may be differentiated from a stone shadow by (1) the variability in its density, as the shadow is irregularly concentrated in different portions; (2) by a shadow of lesser density throughout than that usually observed with stone; and (3) by its irregular and indefinite outline. The calcareous area may, however, simulate the shadow of a renal stone in every particular, and it may be quite impossible to differentiate it without further clinical data. The same is true of renal stones that are occasionally seen of such consistency that the shadow will be fully as irregular and hazy in outline as a typical tuberculous shadow. It may be said, however, that approximately 75 per cent of tuberculous renal shadows may be recognized as such in the roentgenogram."

Cross section of the removed kidney shows that the shadows are due to deposits of lime encrusting the ends of the calices and to caseated areas containing sufficient deposits of cal-

cium to cast a shadow. These shadows are classified in groups:

"(1) Multiple scattered small areas, (2) single or a few localized areas of one centimeter or more in diameter, and (3) large irregular, diffuse areas involving either a large portion or the entire kidney.

"In the first group the small scattered areas are generally caused by lime deposits. They are occasionally seen singly, and appear as elongated, irregular faint streaks, or as multiple punctate areas, scattered over a large portion of the kidney, usually in one of the poles. Unless the renal area in the roentgenogram is carefully examined such areas may easily be overlooked.

"The second group representing single or several isolated areas of concentrated calcareous deposit is the type most easily confused with stone. The shadows are usually of several varieties: (1) a shadow of irregular outline with a consistency dimmer than that seen with renal stone and varying in size from 1 to 3 or 4 cm.; (2) a shadow characterized by great irregularity in its consistency and outline, somewhat resembling filigree work; and (3) definite shadows with a density and contour suggestive of stone. The size of the shadow in no way indicates the extent of the tuberculous lesion. A shadow of only a centimeter or two in diameter may be present in a tuberculous lesion involving the entire pole or even the complete kidney.

"The third group is characterized by large, regular rounded shadows of variable density in their various portions. As a rule, on section, the kidney is of a putty-like consistency in the area which causes the shadow. It is, however, impossible to say from the appearance of such caseated areas whether or not a shadow will be present in the roentgenogram. In two caseated areas of similar appearance one may cast a shadow and the other none at all. Occasionally the calcium deposit is so slight that a soft diffuse shadow will be seen only on careful plate reading, and it may be easily confused with similar shadows cast by the bowel.

"Shadows caused by complete caseation of the kidney are most striking. They may assume the outline of a complete cast of the kidney and are usually irregularly lobulated. The shadow may vary in density in different portions of the kidney, some of which may be so dim as to be scarcely discernible, while others may be definitely and strikingly outlined. Occasionally, with complete or extensive calcification, the calcium deposit may be so slight that the *x*-ray simulates that of accentuated normal renal outline, and it may be difficult to determine whether or not it is an actual pathologic shadow.

"Actual renal stone formation is rare in tuberculous kidney. When it does occur it is generally a phosphatic stone, formed in a localized abscess with necrosis and secondary infection. We have observed this in several cases. Stone formation in the opposite kidney in cases in which a tuberculous kidney had been removed occurred in but two instances that came under our observation. One patient passed a small renal calculus from his remaining kidney two years after the other kidney had been removed for tuberculosis. It may be inferred that primary stone formation is unusual in patients with renal tuberculosis."

These T.B. shadows must be differentiated from renal calculi, intestine contents, gall stones, calcareous deposits in glands in perirenal tissue in the pleura.

"Ureteral shadow: Calcareous deposit may occur with tuberculosis in the ureter, although less frequently than in the kidney. When it is present a considerable portion of the ureter, usually the lower portion, is involved. The shadow may be several centimeters or more in length and outline the dilated ureter to a greater or less extent. The shadow is caused either by calcareous deposits in the thickened wall of the ureter or by intra-ureteral calcareous deposits. Such deposits are generally accompanied by similar caseation in the kidney. Considerable peri-ureteritis may accompany this calcification of the ureteral wall. The peri-ureteral infiltration together with the thickened ureter will often cause a tumor-mass which can easily be palpated on rectal or vaginal examination. Often calcified glands in the bony pelvis will cast shadows suggestive of either stone or tuberculous deposits in the lower ureter. They, however, usually occur with no clinical evidence of tuberculosis in the urinary tract or other portions of the body, and are therefore of no diagnostic significance."

The irregular wavy outline which was formerly considered as very important is regarded as unimportant. The *x*-ray examination is especially valuable in bilateral involvements. This may be important if a T. B. shadow is

found on one side only. This is especially true if one side is chronic and the other acute. "If the bladder is in such a state that it is impossible to make a satisfactory cystoscopic examination a shadow of calcification in one kidney area might be of considerable diagnostic value. This is illustrated in conditions as follows: (1) when the healthy kidney has been catheterized and it is impossible to find or catheterize the other side; (2) when neither meatus is found but the patient's general condition and the renal functional tests indicate the existence of one healthy kidney; and (3) when evidence of disease is found in the kidney that is catheterized, and there is a shadow of calcification in the kidney which cannot be catheterized."

The shadows in the pelvic outline as shown by the pylogram which are regarded as characterized by T.B. are one or more of the following: (1) irregular inflammatory dilatation of the pelvis, (2) areas of cortical necrosis, and (3) stricture in the ureter.

Inflammatory dilatation of the pelvis as the result of tuberculosis in its early stages is largely confined to the calyces. The dilatation is differentiated from ordinary inflammatory dilatation by the greater irregularity in outline of the calyces and by the variability of degree of dilatation among the different calyces. A peculiarity often noticed is marked dilatation at the uretero-pelvic juncture.

When the process is advanced, so as to cause necrosis of the renal parenchyma adjacent to the calyces, the pelvic outline becomes irregular and indistinct to a variable degree. When the necrotic areas are confined to one or two calyces the outline of the latter will have a moth-eaten appearance at the apices, and the pyelographic medium is visible as a hazy shadow extending into the parenchyma. When the necrotic process is advanced it may either assume irregular forms scattered through the parenchyma or it may coalesce to form a large irregular sac.

Occasionally the outline of the necrotic area is apparently detached from the pelvis or connected with it by a narrow isthmus. When the area of necrosis is confined largely to the cortex and is not directly communicating with the pelvis, the pelvic outline may occasionally become contracted in a manner resembling certain forms of pyelonephritis.

As a result of the infective process in the kidney, inflammatory dilatation of the ureter will follow and may be demonstrated in the ureterogram. Should the ureteral mucosa become ulcerated, however, and a stricture ensue, mechanical dilatation may also be present. Ureteral dilatation resulting from tuberculous stricture in the ureter may be confused with that resulting from a benign stricture, or obscure lithiasis. If the clinical and cystoscopic findings are insufficient with which to identify the lesion, pyelography will usually demonstrate abnormality in the pelvic outline that is suggestive of tuberculosis.

The cystogram may also occasionally be of diagnostic value. This is particularly true when it is impossible to find either one meatus or both. The bladder outline will be variably contracted and usually more in one half of the bladder. The demonstration of a dilated ureter by making a cystogram with the patient in the Trendelenburg position is suggestive of renal involvement on that side. Demonstration of a widely dilated internal bladder, sphincter and posterior urethra in the presence of a severe cystitis is also suggestive of tuberculosis.

CONCLUSIONS

1. The value of roentgenographic diagnosis of renal tuberculosis does not appear to be fully appreciated.

2. Routine roentgenography in every case in which there is evidence of infection in the urinary tract is advisable.

3. Shadows may be found in approximately 20 per cent of patients with renal tuberculosis. Such shadows may require the aid of cystoscopic data in their interpretation.

4. Positive evidence of tuberculosis may be obtained by this method when all other clinical data fail, and when cystoscopic examination is impossible.

5. Shadows due to renal tuberculosis may be arranged into three definite groups.

6. Caseated areas in the ureter and prostate may also be outlined.

7. Pyelography is occasionally valuable (1) in the identification of renal infections of doubtful nature, and (2) in the identification of doubtful shadows in the renal area.

8. The cystogram may also give data of value.

BALFOUR, D. C., M.D., F.A.C.S., Rochester, Minn. Polyposis of the Stomach. (*Surg., Gynec. & Obst.*, Vol. XXVIII, No. 5.)

The patient, a male, thirty-four years of age, presented the first case in which this condition was found in the Mayo Clinic in approximately 69,000 operations, 8,000 of which were for gastric lesions. He came to the Clinic November 8, 1918, because of stomach trouble. A careful elicitation of the history disclosed relevant facts as follows: In 1910 the patient began to have periods of unexplained loss of appetite; during the following five years this periodic anorexia was a great annoyance. The symptom which finally brought him to the Clinic, pain with an empty stomach, first manifested itself in 1915. For a short time after its onset the pain showed some periodicity, but during the greater part of the three years it has occurred daily. The patient described the pain as a cramp beginning in the right and in the left hypochondrium and radiating toward the midline of the epigastrium; it was not associated with burning or with the usual subjective symptoms of hyperacidity, although it occurred only when the stomach was empty. He further stated that the stomach seemed to empty very rapidly and that the period of freedom from cramps after the ingestion of food had become increasingly shorter. By frequent eating he had kept his distress at a minimum and his nutrition was practically normal. There had been no nausea or vomiting or evidence of gastric bleeding. The patient had been discharged from the army in 1917 on a diagnosis of pulmonary tuberculosis, and after five weeks in a sanitarium home treatment was maintained until June, 1918.

"The physical examination did not disclose any abnormal findings. There were no evidences of pulmonary lesion either clinically or by *x*-ray and the Wassermann test was negative. The test meal showed an absence of free hydrochloric acid and the presence of a considerable quantity of epithelium. This achylia explained in a measure the symptoms of which the patient complained, and considered with the character of the gastric pain and the fact that it had been continuous over a period of almost three years practically excluded gastric or duodenal ulcer. The only clue which led to preoperative diagnosis, was secured by *x*-ray examination. The entire pyloric end of the stomach exhibited a diffuse mottled appearance, apparently well demarcated both at the pylorus, and at a line about 4 inches from the pylorus. Dr. Carman, after a re-ray at which any possibility of complicating factors, such as the patient's having taken food before the examination, was excluded, made a diagnosis of gastric polyposis.

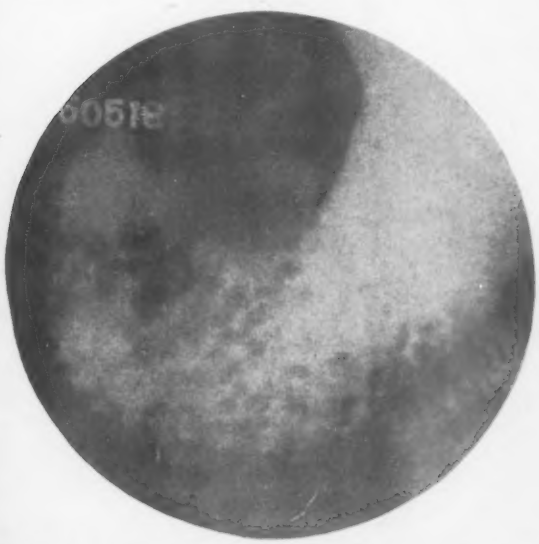

FIG. 1. (250518). THE MOTTLED APPEARANCE (DARK AREAS) IN THE ROENTGENOGRAM ARE SHADOWS DUE TO THE POLYPI IN THE STOMACH.

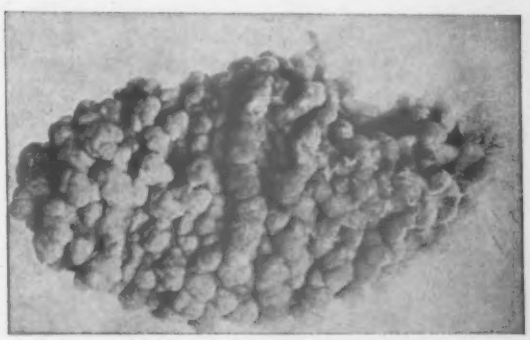

FIG. 2. PHOTOGRAPH OF SPECIMEN.

"The operation was done on November 19th by Dr. Sistrunk. On inspection the stomach was found to be normal in appearance; on palpation, however, a soft doughy thickening of its wall extending from the pylorus to a line about 5 inches above was immediately evident, and although this did not give the sensation

of an actual tumor, the lines of demarcation were quite definite and corresponded with those apparent in the roentgenograph. Resection was carried out along these lines; about two-fifths of the stomach was removed."

A section of the gastric wall containing a tumor examined microscopically showed the bulk of the tumor to be composed of a tremendously hypertrophied mucous membrane. No hyperplasia of glandular element was of a character to suggest malignancy.

BLOOMFIELD, ARTHUR L., and WATERS, C. A. The Correlation of *X*-ray Findings and Physical Signs in the Chest in Uncomplicated Epidemic Influenza. (*Bulletin of The Johns Hopkins Hospital*, Vol. 30, No. 3421.)

The exact significance of lung lesions in epidemic influenza is a disputed question. The opinion is held that bronchopneumonia, while occurring with or following influenza, was not an essential feature of the disease but a complication. It seems possible that small pneumonic areas may exist without signs. The present study was undertaken to see if an *x*-ray examination could throw light on the question.

The material consisted of sixteen consecutive cases of uncomplicated epidemic influenza treated in the wards of The Johns Hopkins Hospital during January and February, 1919. The diagnosis was based on the symptoms, the hyperemic phenomena of skin and mucous membranes, the course of the disease, the duration of the fever, and the presence of leucopenia. In no case was there any evidence of pulmonary complications—the lungs remained clear throughout on physical examination, and cough, if present, was dry and productive only of the usual slight mucoid expectoration associated with the hyperemia of the mucosa of the upper respiratory tract.

Roentgenographic examination of the chest was made as soon as possible after admission and thereafter at two or three-day intervals until the patient was discharged. Each series of plates was studied with two points in mind —first to discover and interpret any abnormal markings, and secondly, to determine any variations in the pulmonary shadows during the course of the disease.

RESULTS

In no case was there any detectable change in the appearance of the lung markings in a series of from three to six plates made at various times during the febrile and post-febrile convalescent stages of the disease. It would seem, therefore, that the markings were permanent or at least unassociated with the immediate acute disease. In no case was any shadow seen which could be interpreted as indicating a solidification of the lung. The usual grades of root shadows, in some cases small areas of probable calcification (glands?) resulting from infections prior to the influenza, and in others slight degrees of apical clouding were seen. It is not the present purpose to discuss the exact significance of pulmonary shadows in general.

CONCLUSIONS

1. Repeated roentgenographic examinations of the lungs during the course of clinically uncomplicated cases of epidemic influenza showed only permanent lung markings.

2. These findings support the clinical impression that bronchopneumonia is a complication and not an essential feature of the disease.

KAUFMAN, LOUIS RÉNÉ, M.D., F.A.C.S., Attending Surgeon, Flower Hospital, New York. Chronic Gastric Ulcer. *The International Journal of Surgery.*

Great stress is laid upon an *x*-ray study of the stomach. Special emphasis is placed upon the serial method. The importance of team work between the clinical staff and the surgeon is emphasized so that they all speak the same language. They soon establish a technic in their study of cases which permits fairly accurate work in distinguishing between chronic appendicitis, adhesions, and numerous other conditions, to be differentiated before operation.

MEMBERS AND GUESTS ATTENDING THE TWENTIETH ANNUAL MEETING OF THE AMERICAN ROENTGEN RAY SOCIETY
AT SARATOGA SPRINGS, N. Y., SEPTEMBER, 1919.